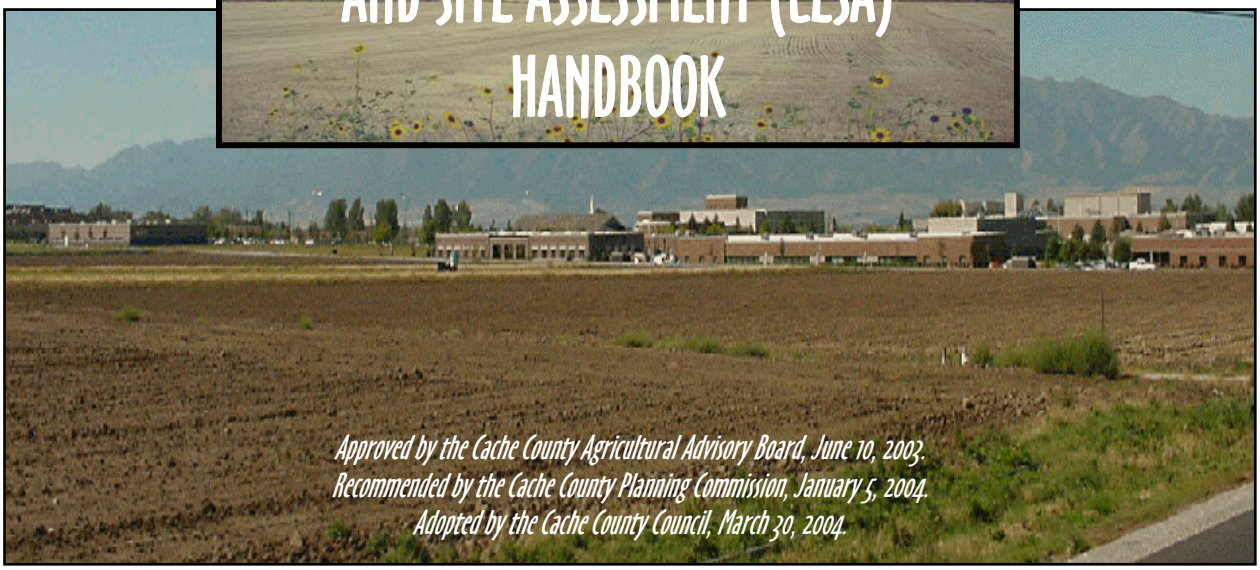
CACHE COUNTY, UTAH

AGRICULTURAL LAND EVALUATION AND SITE ASSESSMENT (LESA) HANDBOOK



Approved by the Cache County Agricultural Advisory Board, June 10, 2003.
Recommended by the Cache County Planning Commission, January 5, 2004.
Adopted by the Cache County Council, March 30, 2004.

Acknowledgements

This Guide was developed by members of the LESA Subcommittee for the Cache County Agricultural Advisory Board (AAB) in the spring of 2003.

It was adopted by members of the Cache County AAB on June 10, 2003.

The LESA Subcommittee would like to acknowledge several people for their contributions to this guide:

- Dr. Douglas Jackson-Smith for developing and articulating clear examples, formulas, and concepts and for writing the text and creating the illustrations used in this handbook;
- Glen Busch for developing the GIS data layers, evaluating the test parcels during our fieldwork, and producing the maps included in the guide;
- Lee Nellis and Randy Carpenter of the Sonoran Institute for providing initial guidance to the committee and for commenting on drafts of this document; and
- The numerous farmland owners and operators in the valley who allowed the subcommittee to use their lands as test cases when we field tested our initial LESA model.

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BACKGROUND

Agricultural Resources in Cache County:

Embraced by the Wellsville Mountains to the west and the Bear River Range to the east, Cache Valley's beautiful natural setting contains a tremendous agricultural land base.

Located northern Utah, Cache County comprises 1,174 square miles, or 751,360 acres. Roughly half of the county is mountainous, forested and publicly owned. The lower elevation valley lands are predominantly privately owned and used for agriculture. The county now supports 91,400 residents in 19 municipalities and the unincorporated county. The map on the next page provides a graphic illustration of the geographic setting of Cache County.

Cache County is one of Utah's leading agricultural counties, consistently ranking Number 1 or 2 in the state for farm-gate receipts. Farm-gate sales consistently produce more than $110 million annually. The 1997 Census indicates that 66% of Cache County's farmland is "cropland" (177,000 acres) and 29% (77,000 acres) is pasture/rangeland. The average farm size was 216 acres, though roughly 4 in 10 farms operate less than 50 acres. Two thirds of the county's farmland, however, is operated by farms over 260 acres. In 1997, sales of livestock and dairy products accounted for 87% of all gross farm sales ($90 million) while crop sales account for 13% of gross farm sales ($14 million).

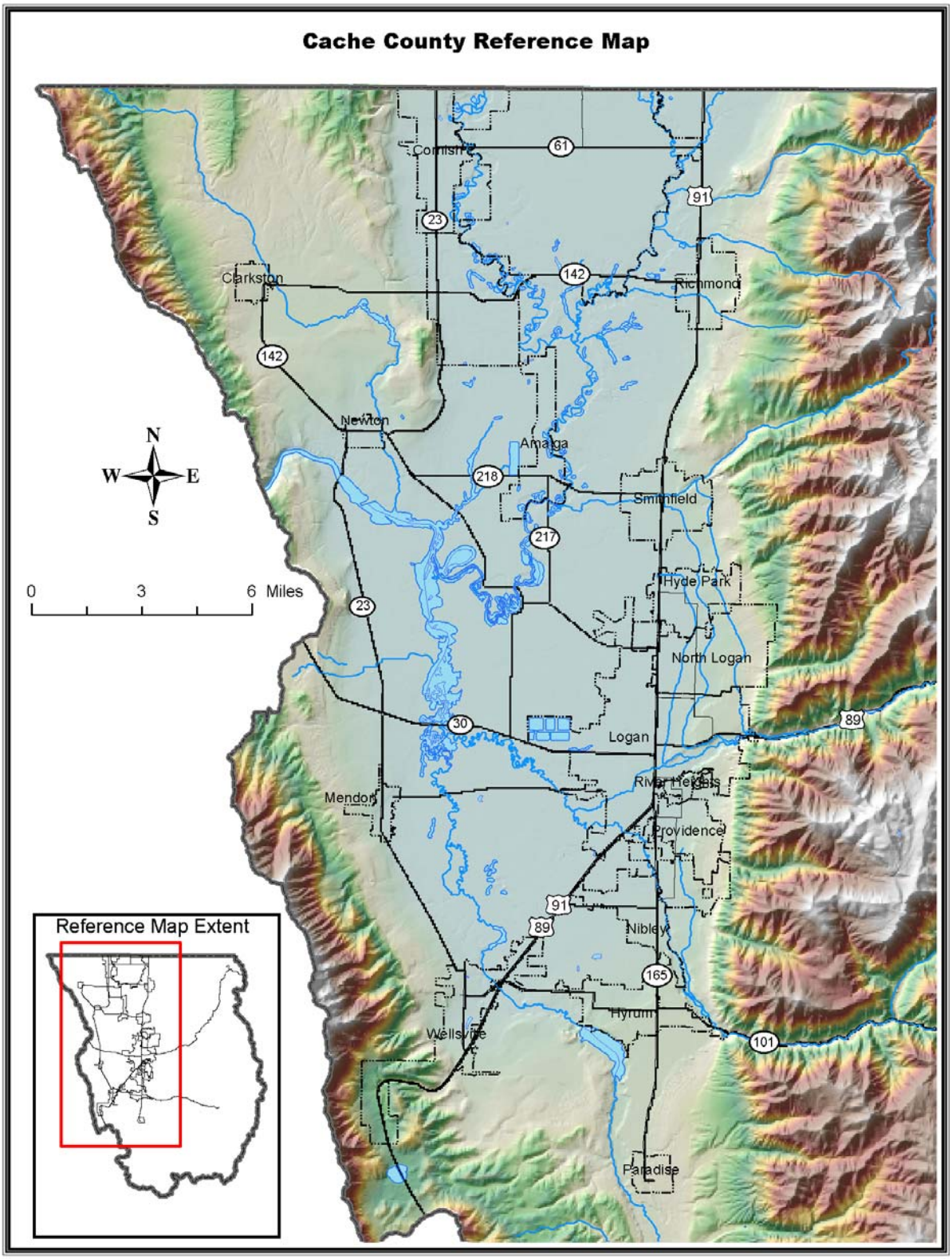
The broader agricultural sector – including agriculture production, services, and processing – generates more in additional output, value added, and employment than any other industry sector in the county. Agriculture produces 26% of all gross economic output in Cache County. Economists estimate that for every $1 million of agricultural product output, an additional $830,000 worth of seeds, feed, chemical supplies, equipment, custom work, fuel, etc., will be required to produce those agricultural products. This is the highest "Type 1" multiplier of any industry in Cache County. For every new job created in Cache County's agriculture sector, 2.03 additional jobs are created in the sectors that supply seeds, feed, chemical supplies, equipment, custom work, fuel, as inputs to agricultural production. Likewise, these 2.03 jobs could be lost for each agricultural job lost.

Cache County's population grows by two percent each year. In 2030 the population is projected to be 143,600.

Urban encroachment on farmland has serious implications for the farm sector. As the county's economic base and population has grown, important agricultural lands have been converted to urban uses. Since 1986, Cache County has lost 8,884 acres of prime and statewide important farmland - nearly 14 square miles - to urban development. The current rate of development is consuming over 600 acres of prime and statewide important farmland each year.

As we plan for the future and the most cost efficient means for housing this population growth, it is important to note two things: 1) Housing is most affordable in communities where infrastructure such as water, sewer, roads, and schools are already available and 2) agricultural lands actually subsidize residential development. Studies have shown that farmland in the valley only requires .57 in public services for each dollar paid in property taxes. Meanwhile residential land receives $1.27 in services for every dollar paid in taxes.

As proposed, the Cache County LESA identifies which lands should have the highest priority for preservation recognizing that areas already served by infrastructure are the most suitable for development.


Cache County Reference Map
Cornish
61
91
23
Clarkston
142
Richmond
142
Newton
Amalga
218
Smithfield
217
N
W
E
S
0
3
6 Miles
Hyde Park
23
North Logan
30
89
Logan
Mendon
River Heights
Providence
91
89
Nibley
165
Hyrum
Wellsville
101
Paradise
Reference Map Extent

Farmland Preservation Efforts:

Agricultural land preservation efforts are as much a part of Cache Valley's history as agricultural land use. In 1969 the first county master plan was unveiled as a result of Cache Valley mayors working closely with planning consultants. The process entailed hundreds of interviews with Cache Valley residents and found a strong desire for maintaining the area's unique way of life. The master plan was intended to preserve this uniqueness by maintaining the green-belt areas between each community.

But with the closure of numerous creameries, sugar and vegetable packing factories and increasing land values, farm land between communities began to disappear. In 1976, the Cache County Commission appointed the Cache County Extension Agent to serve on a task force to address the problem of strip development along highway 89/91 and the preservation of farm ground.

In 1984 a Numerical Evaluation System was adopted to discourage sprawl and protect prime and statewide significant soils from development.

In 1994 the Cache County Farmland Preservation Committee was established to identify issues, provide education and make recommendations for farmland protection efforts.

In 1998 the Cache County Countywide Comprehensive Plan was adopted. Implementation policies in that plan "acknowledge prime and statewide significant farmlands for protection and limit development on these lands". The comprehensive plan policies also address the need for economic development efforts to "promote agriculture and agricultural industries ... the same as other commercial and industrial businesses".

In 1999 State Representative Olsen (for the third time) introduced local option sales tax legislation that would enable Counties (with voter approval) to use 1/8 % sales tax for agricultural and open land conservation. (Passed House, Failed Senate) In that same year Cache County commissioned USU Extension to conduct a resident survey as part of Cache County Growth Management Study: 69% of respondents wanted to preserve agricultural lands between communities.

In 2001 funding was received to create a county wide agricultural land preservation program.
In February 2002 the Cache County Council adopted a resolution to create the first county agricultural advisory board in the State of Utah to recommend criteria, policies and implementation tools to protect critical farmlands and open spaces. One such tool to help identify which lands should be protected is the LESA (Land Evaluation and Site Assessment).

Creation of LESA Sub-Committee

The Agricultural Advisory Board contracted with Sonoran Institute for advice on developing a LESA scoring system for evaluating lands in terms soil productivity and site characteristics. A day long workshop was held December 2002 with field tests to help understand the development and testing of a local LESA. In January 2003, the AAB adopted a focus statement for Cache County's LESA and created a sub-committee to develop the LESA to be ratified by the AAB and the County Council.

> **Focus Statement:** "The Cache County LESA System will be used to identify and prioritize which agricultural lands and open range lands should be preserved." The initial focus of the Cache County LESA is to prioritize parcels of land that might seek to receive public funds for purchasing development rights under a conservation easement program.

This handbook is the result of numerous weekly meetings involving informed and lively discussions by the committee members.

LESA Committee	
Dennis Austin	State Division of Wildlife Resources
Jack Draxler	Cache County Planning Commission
Joe Fuhriman	Agriculture Advisory Board, Chairman
Douglas Jackson-Smith, Vice Chairman	Utah State University, Department of Sociology, Social Work and Anthropology, Professor
Garr Morrison	Lewiston State Bank
Bill Oblock	Citizen Advocate for Local Agriculture, AAB member
Lane Parker	Smithfield Livestock Auction, AAB member
Val Jay Rigby	Agricultural Producer, AAB member
Wesley Roundy	Agricultural Producer, AAB member
Chris Sands, Chairman	Bio West, AAB member
Saundra Schimmelpfennig	Bridgerland Audubon Society
Staff for LESA Committee	
Glen Busch	USU College of Natural Resources, Intern
Cindy Hall	Bear River Association of Goverments
Jon Hardman	USDA Natural Resource Conservation Service
Clark Israelsen	USU Cooperative Extension
Mark Teuscher	Cache Countywide Planning and Development
Richard Toth	USU College of Natural Resources, Professor

THE CACHE COUNTY LESA FORMULA

What is a LESA system?

The term "LESA" refers to a Land Evaluation and Site Assessment system.

Most LESA systems are designed to assign a numerical score to particular parcels of farmland. When used in farmland preservation programs, the LESA scores usually reflect how important each parcel is to the community's overall supply of agricultural land. LESA scores can be used to compare different parcels and to set priorities for the allocation of scare public dollars for the protection of farmland.

Because agriculture is quite different across the country, typically a LESA system is customized to reflect unique conditions present in each county. Moreover, each community might seek to accomplish different goals with their LESA system, and they will want to ensure that the LESA scores reflect their local concerns and priorities.

A LESA system usually measures two major kinds of qualities associated with parcels of farmland.

The first is the Land Evaluation (or 'LE') component, which measures the productivity of the soils for the purposes of agricultural production. The LE component of a LESA score is usually evaluated using official soil maps and associated information about crop yield potential, any cropping limitations, and other physical traits associated with each soil type. The LE component is mean to capture the innate productivity of agricultural soils *independent of how a particular producer might be managing the resource*.

The second component of a LESA score is related to Site Assessment (or 'SA') factors. These SA factors are qualities of the parcel that go beyond the productivity of the soil. They usually reflect site characteristics that make a parcel more or less attractive for future agricultural activity.

There are three main types of SA factors used in most LESA systems. These include:

- SA-1 factors = characteristics that make parcel MORE ATTRACTIVE for future agricultural use
- SA-2 factors = characteristics that recognize different pressure from nonfarm development
- SA-3 factors = characteristics that reflect non-agricultural values that certain parcels offer to the community

In order to design a LESA system, representatives from the local community typically select a handful of SA factors that reflect characteristics that they believe make parcels more or less attractive for farmland preservation program funding. They must pick factors that can be objectively measured for all parcels of land in their county, that can be evaluated fairly easily, and that capture the important priorities and concerns of the community. Most modern LESA systems utilize extensive Geographic Information Systems databases and technology available from local, state and federal government offices.

Once the LE and SA components are identified, a score between 0 and 100 is assigned to each LE and SA factor. The various LE and SA factors are then combined into a single score by creating a formula that assigns different "weights" to each factor so that the total maximum score is 100.

The local LESA committee usually spends considerable time and effort fine-tuning the scoring system until they are comfortable that the relative scores assigned to parcels reflects their sense of the local importance of particular farmland parcels.

Overview of the Cache County LESA formula

The Cache County LESA committee identified two distinct LE factors, and seven SA factors that will be used to calculate LESA scores for farmland parcels in the county.

The two LE factors are each based on official soil maps maintained by the USDA Natural Resource and Conservation Service (NRCS). First, each individual soil mapping unit is linked to an estimate of crop yield potential. For comparison purposes, an estimate of forage yields under non-irrigated conditions is used to generate this part of the LE score. The second LE factor reflects information about the "Land Capability Class" assigned to each soil mapping unit. The Land Capability Class reflects whether or not the soil unit is considered to be of national, statewide, or local importance for farming. In addition, it recognizes potential constraints (like high water table, steep slopes, etc.) that might affect the ability of agricultural soils to be used to their full potential.

Two SA-1 factors were included in the Cache County LESA formula. These are both meant to identify parcels with site characteristics that enhance their potential for commercial agricultural use in the future. The first SA-1 factor reflects the size of the parcel (or block of contiguous land included in the proposal). The basic idea is to assign more LESA points to parcels that include more land. The second SA-1 factor assigns additional points to parcels that are part of an ongoing commercial-scale agricultural operation.

Three SA-2 factors were included in the Cache County LESA formula. The first assigns more points if a proposed parcel is adjacent or close to other protected lands. This is meant to encourage consolidation of larger areas of protected farmland throughout the valley. The other two SA-2 factors are designed to measure the amount of non-farm development pressure surrounding the proposed parcel. In each case, the LESA formula is designed to prioritize important farmlands that are experiencing significant or impending development pressure (yet which have yet to become so built up that agriculture is no longer viable).

The two SA-3 factors included in the LESA formula reflect the non-agricultural values provided by farmland in the county. The first recognizes that certain agricultural parcels also contain important natural resource lands (such as wildlife habitat, wetlands, or groundwater recharge zones). In general, parcels with significant natural resource land attributes receive more points under the LESA system. The second SA-3 factor identifies key agricultural lands that are part of the rural visual landscape. More points are assigned to parcels that can be seen from key observation points throughout the valley.

Calculating LESA Scores

Because of the complexity of evaluating parcels of land under the LESA system, the committee decided to **calculate LESA scores only for single fields/parcels or clusters of contiguous fields**. For the purposes of the LESA analysis, contiguous fields are defined as those that are either immediately adjacent or are separated only by a road or naturally occurring waterway. Owners of multiple parcels that are not adjacent can have each block of contiguous land evaluated and scored separately.

Regular application deadlines for evaluating parcels will be set by the LESA committee, and scores will be calculated using the best available information at the time of application. After an initial assignment of LESA scores, a field visit and meeting with the landowner will be made by LESA committee members or staff to consider adjustments or corrections in the proposal scoring.

The final scores assigned to a proposal must be approved by a majority of county LESA committee members present at their next regular meeting. Applicants can appeal their scores to the full AAB if they disagree with the LESA committee decision. The LESA committee also will review the LESA model on a regular basis, and make any recommendations for modifications to the full Cache County AAB.

CALCULATING THE "LE" FACTOR SCORES

The Land Evaluation component of the LESA formula will be based on the most recent digitized soil map for Cache County (maintained by the USDA/NRCS). Each parcel will receive an area-weighted average score on each of following two indices. The goal of the LE factor scores is to measure the value for agricultural production of the soils in the proposed parcel. Higher scores reflect better production potential, holding management ability and techniques constant.

1. Soil Productivity Index (SPI)

a. The physical crop production capability of each soil mapping unit in the county will be determined using NRCS estimates of the non-irrigated hay/forage yield potential. The estimated yield potential reflects the best scientific estimate of the ability of the soil to produce a commonly grown crop, holding management ability or conditions constant.

b. Each soil will receive an SPI score between 0 and 100 based on the yield potential of the soil unit relative to the other soils in Cache County (where the most productive soil is a "100" and the least productive is a "0").

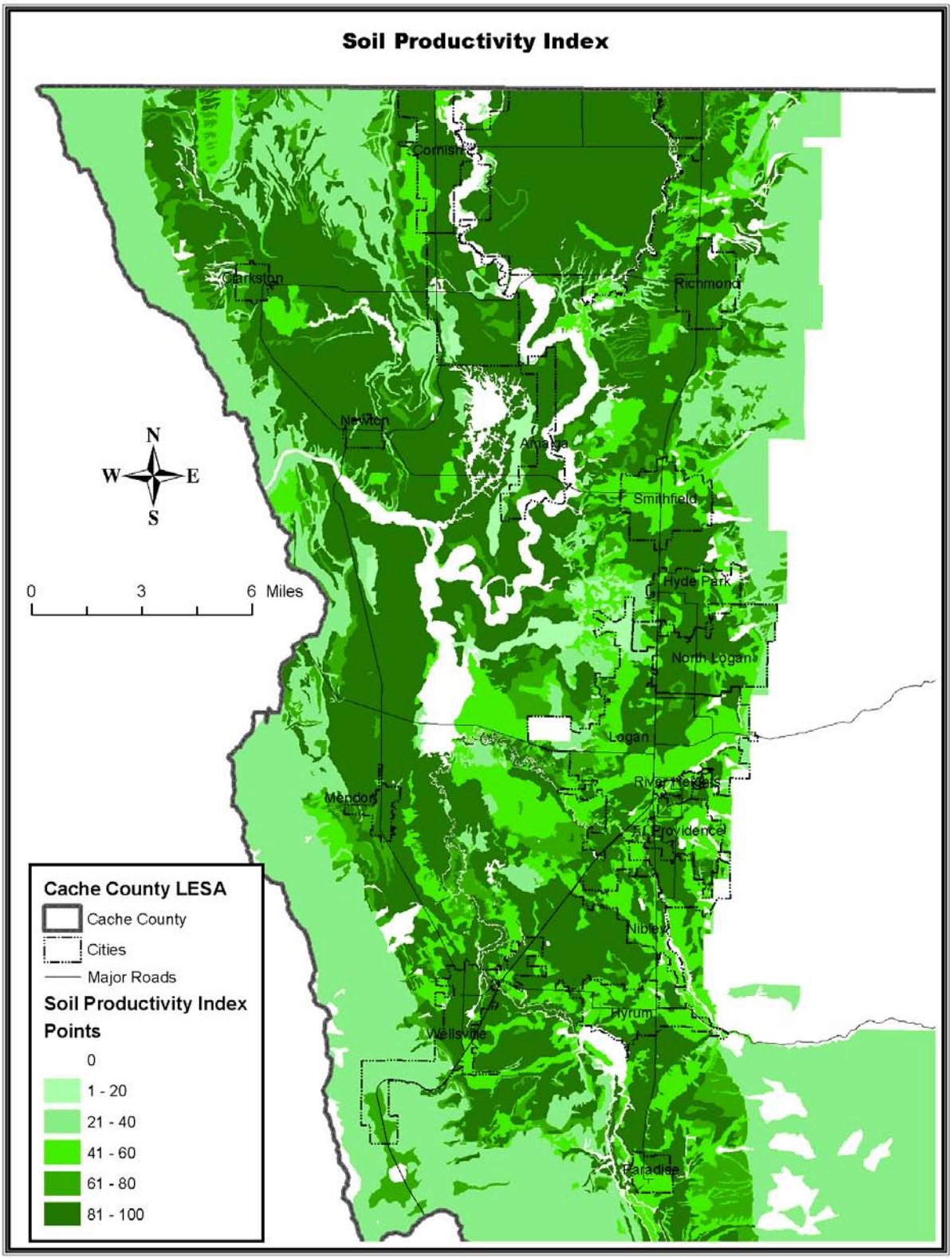
2. Land Capability Index (LCI)

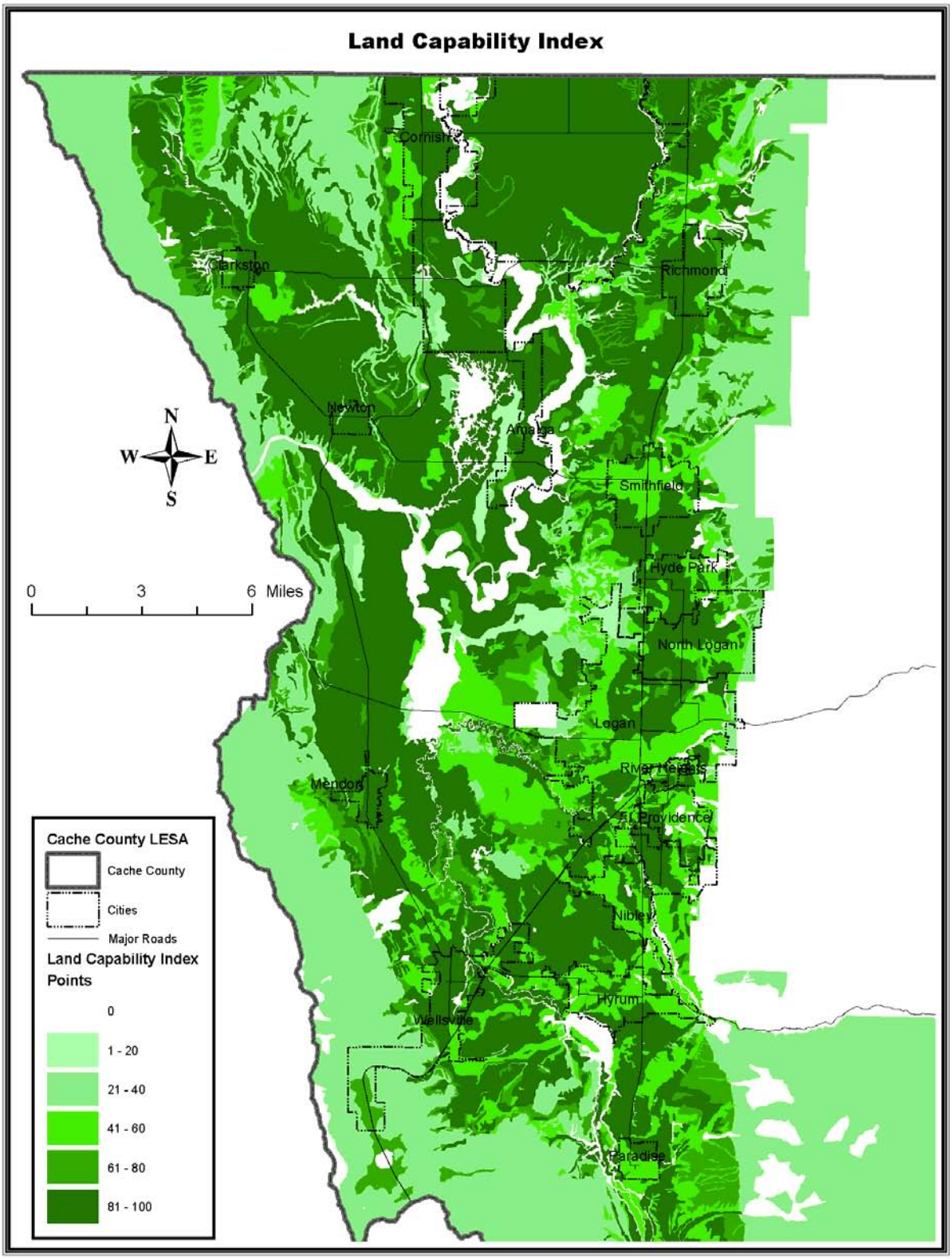
a. Each soil mapping unit will receive points based on two attributes. First, each soil unit is associated with a standard NRCS "land capability" type. These reflect the underlying suitability of the soil type for agricultural production. Second, many soil units have been officially designated as either of local, statewide, or national (prime) importance for agriculture.

b. These two attributes are combined to generate a score between 0 and 100.

	DESIGNATION (weight)			
Land Capability Scale	**Prime (1.25)**	**Statewide (1.10)**	**Local (1.00)**	**None (0.75)**
IIc	100	100	100	75
IIe	100	100	95	71
IIw	100	100	92	69
IIIc	100	99	90	68
IIIs	100	97	88	66
IIIe	100	94	85	64
IIIw	100	90	82	62
IVc	100	88	80	60
IVs	98	86	78	59
IVe	94	83	75	56
IVw	88	77	70	53
Vw	63	55	50	38
VIs	56	50	45	34
VIe	50	44	40	30
VIw	48	42	38	29
VIIs	44	39	35	26
VIIe	38	33	30	23
VIIw	31	28	25	19
VIII	0	0	0	0

The distribution of SPI and LCI scores across soils in Cache County are illustrated in the maps on the next two pages.


Soil Productivity Index
Cornish
Clarkston
Richmond
Newton
Amalga
Smithfield
Hyde Park
North Logan
Logan
River Heights
Mendon
Providence
Nibley
Hyrum
Wellsville
Paradise
N
W
E
S
0
3
6 Miles
Cache County LESA
Cache County
Cities
Major Roads
Soil Productivity Index
Points
0
1 - 20
21 - 40
41 - 60
61 - 80
81 - 100


Land Capability Index
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Cache County LESA
Cache County
Cities
Major Roads
Land Capability Index Points
0
1 - 20
21 - 40
41 - 60
61 - 80
81 - 100

CALCULATING THE "SA" FACTOR SCORES

SA-1 FACTORS (Suitability For Commercial Agriculture)

Two SA-1 factors were included in the Cache County LESA formula.

SA-1(a) SIZE OF PROPOSED PARCEL

Goal and Rationale:

The first SA-1 factor reflects the size of the contiguous land parcel. The committee believes that larger contiguous agricultural parcels will provide a better foundation for future production agriculture in the valley. In other words, all other attributes held constant, parcels that include more contiguous land will be prioritized in the land protection process.

The point system outlined below reflects the view that a parcel that included 160 acres of irrigated land would provide the minimum acreage necessary to support a family-run, commercial agricultural operation in this area. Moreover, committee members believe that 3 acres of non-irrigated cropland, or 6 acres of non-irrigated, non-tilled pasture or rangeland would be required to equal the productivity of 1 acre of irrigated cropland or pasture.

Calculating points:

Points can be calculated by estimating the total acres contained within each proposed block of land that are classified as:

a) irrigated cropland or pasture
b) non-irrigated cropland with a recent history of tillage
c) non-irrigated cropland, pasture or rangeland with no recent history of tillage
d) other nonproductive lands (roads, waterways, buildings and barnyards, etc.)

Land in the first three categories will be used to produce points associated with each category. If the proposal includes lands of different types (e.g., irrigated vs dry), then you calculate the points for each type of land and add up the points to a total not exceeding 100 points.

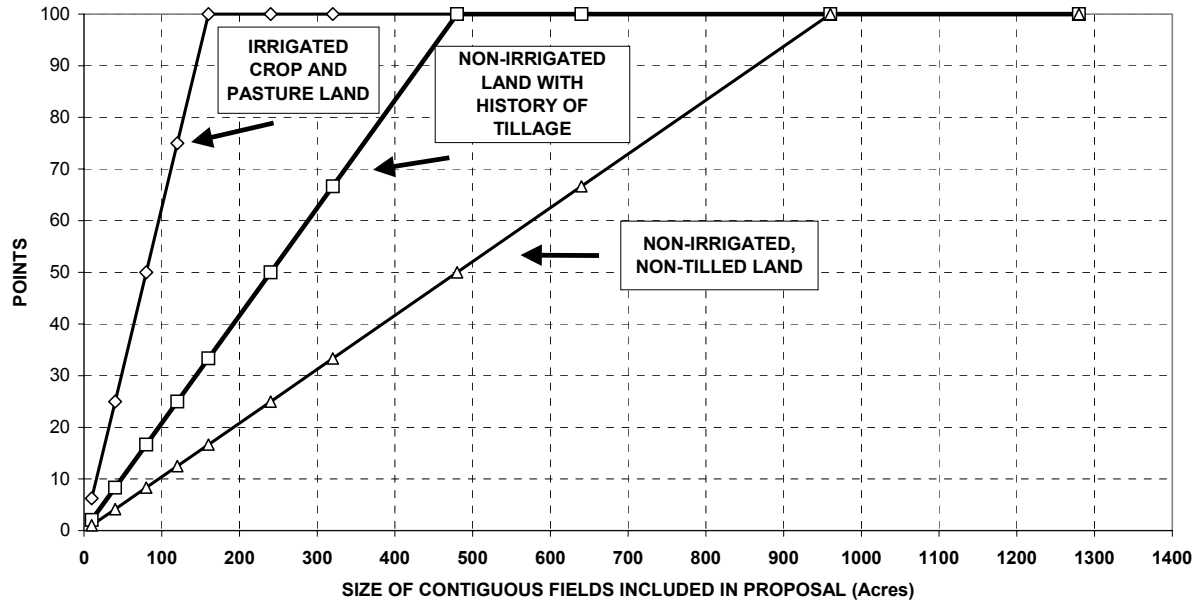
Points = (Type(a) acres / 1.6) + (Type(b) acres / 4.8) + (Type (c) acres / 9.6)

Illustration of how many points are assigned to parcels of different types and sizes is included in the table and figure on the next page.

TABLE FOR SA-1(a) SIZE OF PROPOSAL

Type of Land:	Type (a) Irrigated cropland or pasture	Type (b) Non-irrigated cropland with a recent history of tillage	Type (c) Non-irrigated pasture or rangeland with no recent history of tillage
Illustration			
Acres		*points*	
5	3	1	0.5
10	6	2	1
40	25	8	4
80	50	17	8
120	75	25	13
160	100	33	17
240	100	50	25
320	100	67	33
480	100	100	50
640	100	100	67
960	100	100	100
1280	100	100	100

SA1(a): Points Associated with Size of Proposal



SA-1(b) HISTORY OF COMMERCIAL AGRICULTURAL ACTIVITY

Goal and Rationale:

The second SA-1 factor reflects the belief that parcels of land that are currently being used as part of a commercial scale farming or ranching operation are more likely to be valued by operators of future commercial agricultural operations. Moreover, committee members were concerned that a ranking system based solely on soils or size of parcel may fail to capture the importance of livestock agriculture – particularly dairy farming – to the agricultural economy of Cache Valley.

The point system outlined below reflects the LESA committee view that a parcel that is owned by a person who operates a commercial scale farm or ranch should receive higher priority than the owner of similar lands that are not part of an ongoing commercial operation. To capture the scale of recent commercial agricultural activity, points are assigned in one of two ways. The landowner can decide which method of calculating points from this factor they wish to use. For the purposes of this factor, a landowner should include all livestock or gross farm receipts from any active farming operation(s) that they have an active ownership and management interest in, and that are dependent on the parcel(s) of land that are included in the proposed land protection application.

Option 1: Average Livestock Inventory approach

This approach recognizes that livestock agriculture is the most important contributor to the local Cache County agricultural economy. In the 1997 Census of Agriculture, over 75 percent of gross farm receipts came from the sale of livestock and dairy products. The size of a commercial livestock operation can be estimated by converting the various types of farm animals (cattle, sheep, pigs, poultry, etc.) into standardized "animal units." Fortunately, the USDA-NRCS has developed a set of conversion factors that allow different types of livestock to be compared.

To calculate the points associated with this factor, a livestock farm would go through the following steps:

Step 1: Calculate the average inventory of various types of livestock that were part of a qualified commercial farming operation for <u>each</u> of the 12 months preceding the application for land preservation.

Step 2: Convert these livestock numbers into standardized "animal units" and compute the sum of total animal units for each month.

Step 3: Add up all 12 months of inventory numbers and divide by 12 to compute an "average monthly livestock inventory" figure.

Step 4: Divide the average monthly livestock inventory by 3 to obtain the total points (up to a maximum of 100).

Table for converting livestock numbers into animal unit equivalents:

Type of Livestock	Multiply by:
Cattle	
Mature dairy cow	1.40
Dairy heifers (1,000 to 1,400 lbs)	1.20
Mature beef cow	1.00
Beef stockers, heifers (600 to 1000 lbs)	0.80
Cattle or calves (300 to 600 lbs)	0.45
Bulls	1.40
Sheep and Goats	
Adult sheep and goats	0.15
Lambs and kids	0.75
Swine	
Sows	0.40
Feeder pigs (55 lbs to slaughter)	0.10
Boars	0.50
Poultry	
Chickens (laying hens, broilers)	0.01
Turkeys	0.02
Horses	2.00
Other livestock	Avg. body weight / 1000

Source: Guidelines for Animal Feeding Operation Inventory, USDA-NRCS, 2002; supplemented with information from the USDA/NRCS National Range and Pasture Handbook and the US-EPA CAFO Clean Water Act Requirements publication (EPA 833-F-02-006; 2002).

ILLUSTRATION OF POINTS BASED ON ANIMAL UNITS (points = # animal units ÷ 3)

Animal Units	*points*
10	3
25	8
50	17
100	33
150	50
200	67
250	83
300	100
350	100
400	100

Option 2: Total Gross Farm Sales Approach

For non-livestock operations that have significant commercial agricultural activity (and for some livestock farms), an alternative way to calculate points for this factor is to provide a rough estimate of the total gross receipts for any active farming operation(s) that the landowner(s) submitting the parcel have an active ownership and management interest in, and that are dependent on the parcel(s) of land included in the proposed land protection application. Gross receipts include all sales of crops, livestock, and livestock products that were declared on the most recent tax return by the active farming operation.

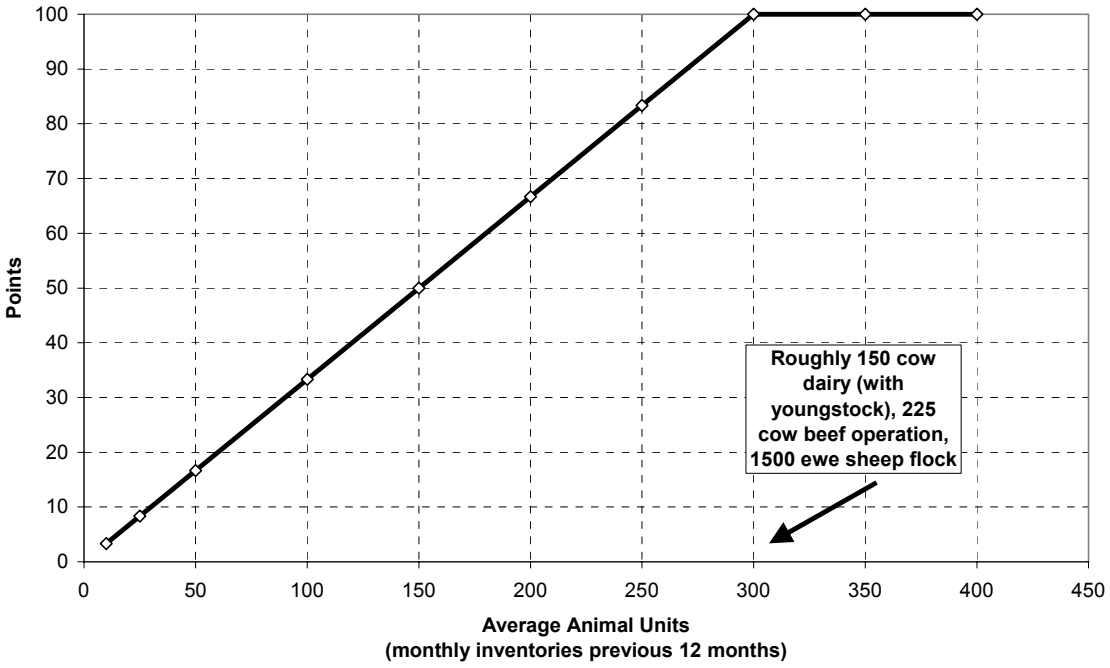
Points are assigned to this factor by dividing the total dollar value of gross sales by $2,500, up to a maximum total of 100 points.

ILLUSTRATION OF POINTS BASED ON GROSS RECEIPTS (points = gross receipts ÷ 2,500)

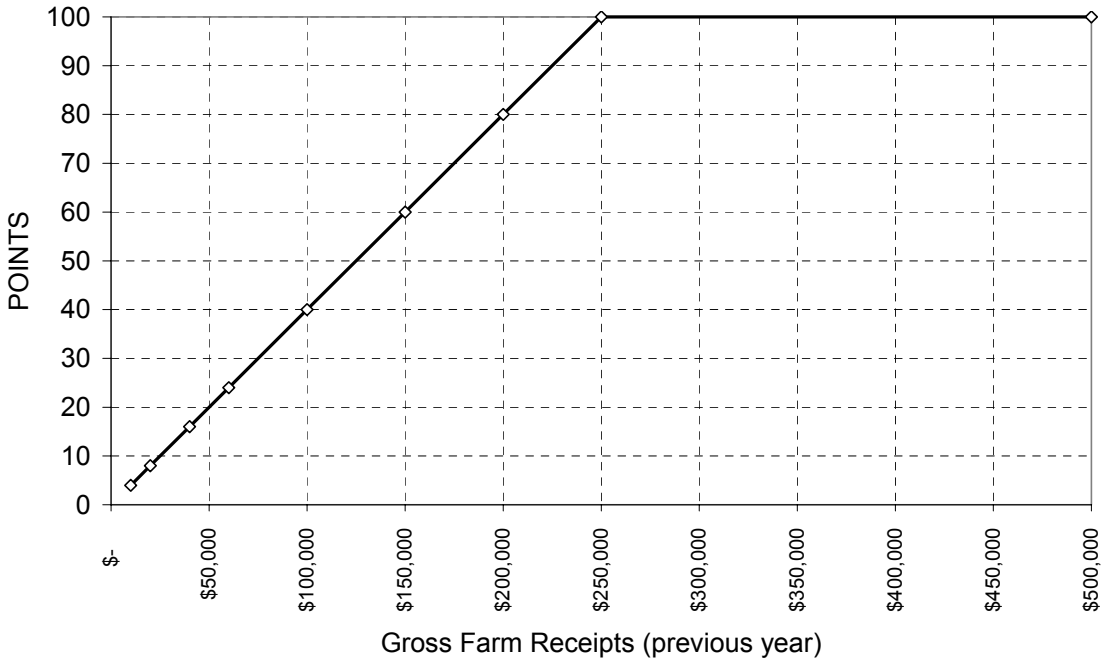
Gross Receipts	*points*
$ 10,000	4
$ 20,000	8
$ 40,000	16
$ 60,000	24
$ 100,000	40
$ 150,000	60
$ 200,000	80
$ 250,000	100
$ 500,000	100

A graphic illustration of how points for the SA1(b) factor are related to the size of a commercial agricultural operation is provided on the next page.

SA1(b): Points associated with Animal Units



SA1(b) GROSS SALES OPTION



SA-2 FACTORS (Pressure From Non-Agricultural Development)

Three SA-2 factors were included in the Cache County LESA formula. These are designed to capture characteristics of the area surrounding the land proposed for protective easements. The three factors include points assigned for parcels that are close to other protect areas, points related to the density of housing development in the neighborhood, and points related to proximity to existing sewered areas.

SA-2(a) PROXIMITY TO PROTECTED LANDS

Goal and Rationale:

It is widely believed that the most effective way to protect a viable agricultural landscape is to protect large blocks of contiguous land (rather than to produce a checkerboard of scattered parcels). The LESA committee believes that proposals for preservation of new agricultural parcels should be prioritized if those parcels are adjacent or close to existing protected landscapes.

The protected landscapes that currently exist in Cache County are shown on map SA-2(a) on the next page and include:

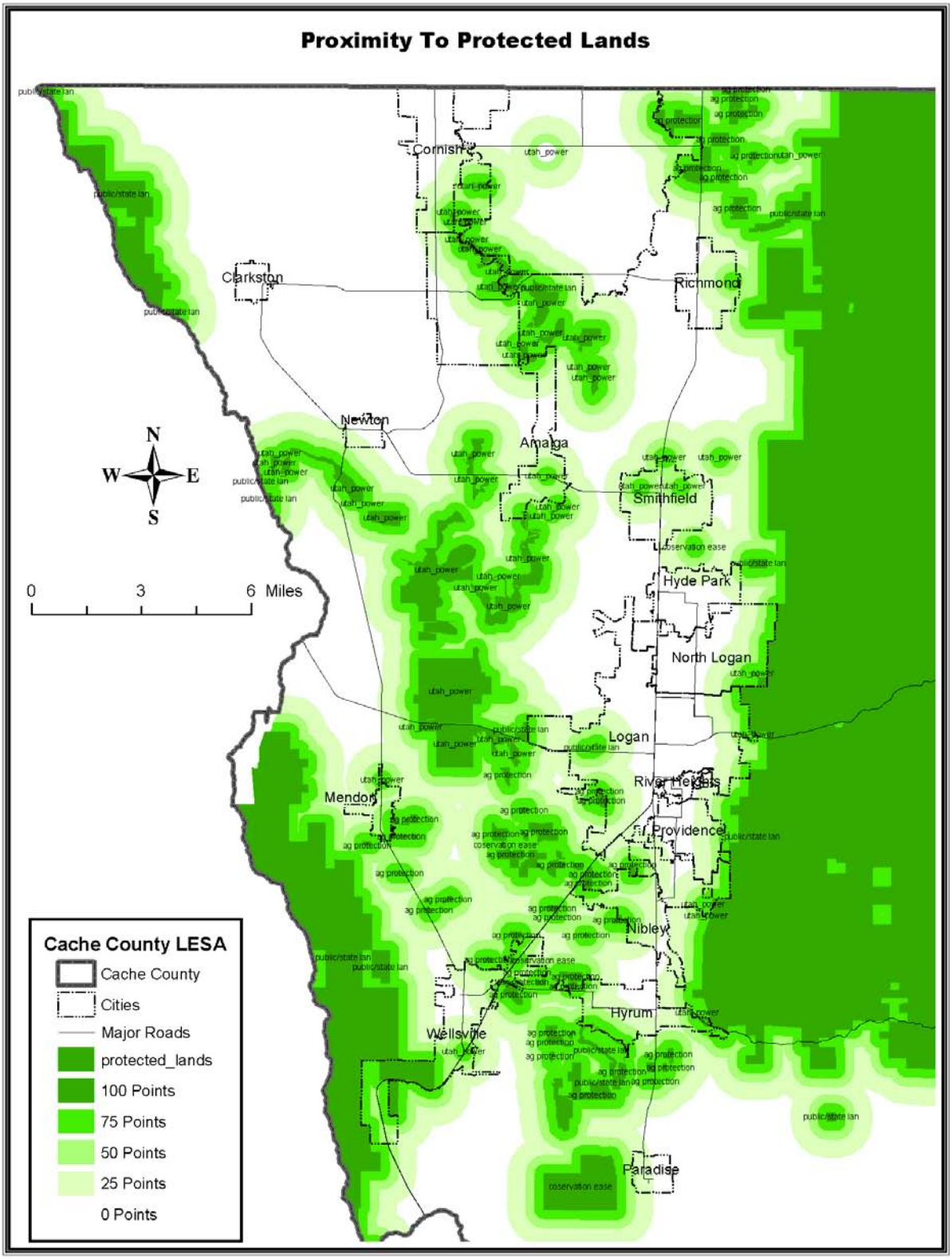
a) agricultural lands protected by conservation easements,
b) lands that fall within officially designated Agricultural Protection Areas (APAs),
c) lands protected DWR or other state agencies
d) lands owned and managed by the federal government (mainly Forest Service Land), and lands owned and managed for conservation purposes by Utah Power and Light.

Calculating points:

Points can be calculated by estimating the shortest distance to protected lands from any point along the outside perimeter of the lands proposed for preservation. The exact number of points assigned to a proposal for this factor are illustrated in the table below.

Points assigned to the SA-2(a) Factor

Distance to Protected Lands	Points
Adjacent	100
less than < 1/4 mile	75
1/4 to 1/2 mile	50
1/2 to 1 mile	25
More than 1 mile	0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Amalga
Smithfield
Hyde Park
North Logan
Logan
River Heights
Mendon
Providence
Nibley
Hyram
Wellsville
Paradise
N
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S
0
3
6 Miles
Cache County LESA
Cache County
Cities
Major Roads
protected_lands
100 Points
75 Points
50 Points
25 Points
0 Points

SA-2(b) DENSITY OF HOUSING DEVELOPMENT

Goal and Rationale:

The LESA committee recognizes that some of the greatest long-term threats to commercial agricultural activities in the Cache Valley lie in the construction of residential housing in and among farm fields, pastures, and rangelands. Such housing development can significantly increase the cost of land (for purchase by expanding or entering farmers, or for rent by ongoing commercial farming operations).

Since one of the primary purposes of the farmland preservation program is to protect agricultural lands from this development pressure, it is important to recognize whether (and how much) residential development already exists near parcels proposed for land protection. The committee also recognized that a balance must be struck between:

a) protecting important agricultural lands that are currently experiencing development pressure, and
b) recognizing that in some cases, too much development has already occurred to enable commercial agriculture to thrive in the remaining open parcels.

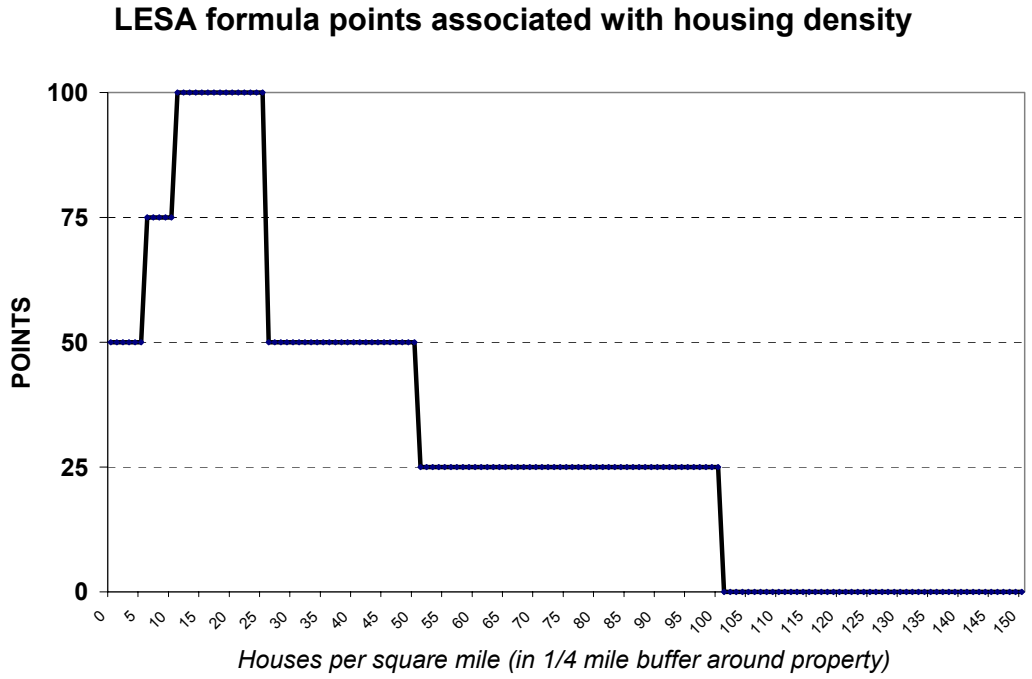
To achieve this balance, the LESA committee decided to award points based on the density of housing development surrounding proposed parcels in the following way. In general, as housing densities increase, more points will be assigned to a proposed parcel of land. However, once housing densities get high enough to interfere with commercial farming activity, the points assigned for this factor will decrease as housing density continues to increase. Housing densities initially will be estimated using current maps of residential development in the county (see map SA-2(b) on page 20 below), supplemented by a field visit to verify the accuracy of the information.

The committee determined that the maximum points would be assigned to parcels with between 10 to 25 residences per square mile within a ¼ mile buffer surrounding the parcel.

Calculating points: The points assigned to housing densities are shown below.

SA2(b) Points Assigned for Housing Density

Houses Per Square Mile (within 1/4 mile buffer)	Points
Less than 5	50
5 to 9.999	75
10 to 24.999	100
25 to 49.999	50
50 to 100	25
More than 100	0



The figure above clarifies how points are associated with different levels of housing development within a quarter-mile of the property.

Exploring the practical effect of the housing density thresholds

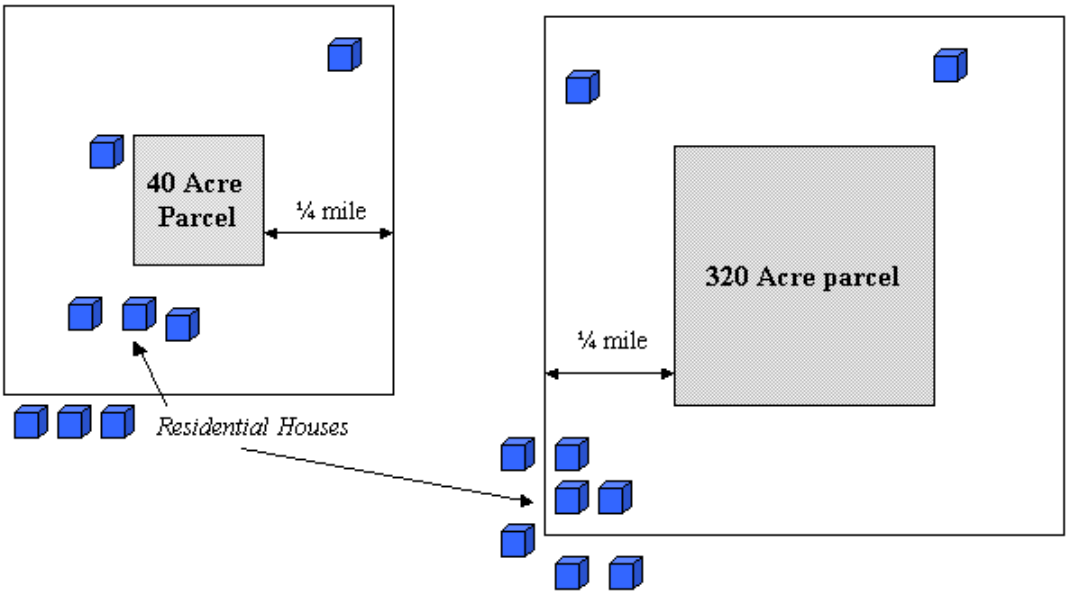
Because the points are associated with housing *density* (per square mile) – and not sheet numbers of houses in the ¼ mile buffer – the number of nearby houses that meet certain density thresholds will vary depending on the size of the proposed parcel of land.

To illustrate this, note that if a square 40 acre parcel is proposed for land preservation, a ¼ mile buffer drawn around the parcel would include a total of 320 acres (or 0.5 square miles). If there were 5 houses within a quarter-mile of the property, it would translate into a density of 10 houses per square mile (or 5 houses per ½ square mile).

If a second parcel included 320 acres, the ¼-mile buffer would encompass a total of 640 acres of land, or 1 square mile. If there were 5 houses in this buffer area, it would translate into a density of 5 houses per square mile.

Depending on the size of the proposed parcel, the approximate number of houses that would be associated with points on this factor is listed on the table below. Of course, the precise number of houses associated with different density levels will depend on the overall size and configuration of each proposed parcel.

The figures and table on the next page illustrate the relationship between parcel size and housing density within the ¼ mile buffer areas.

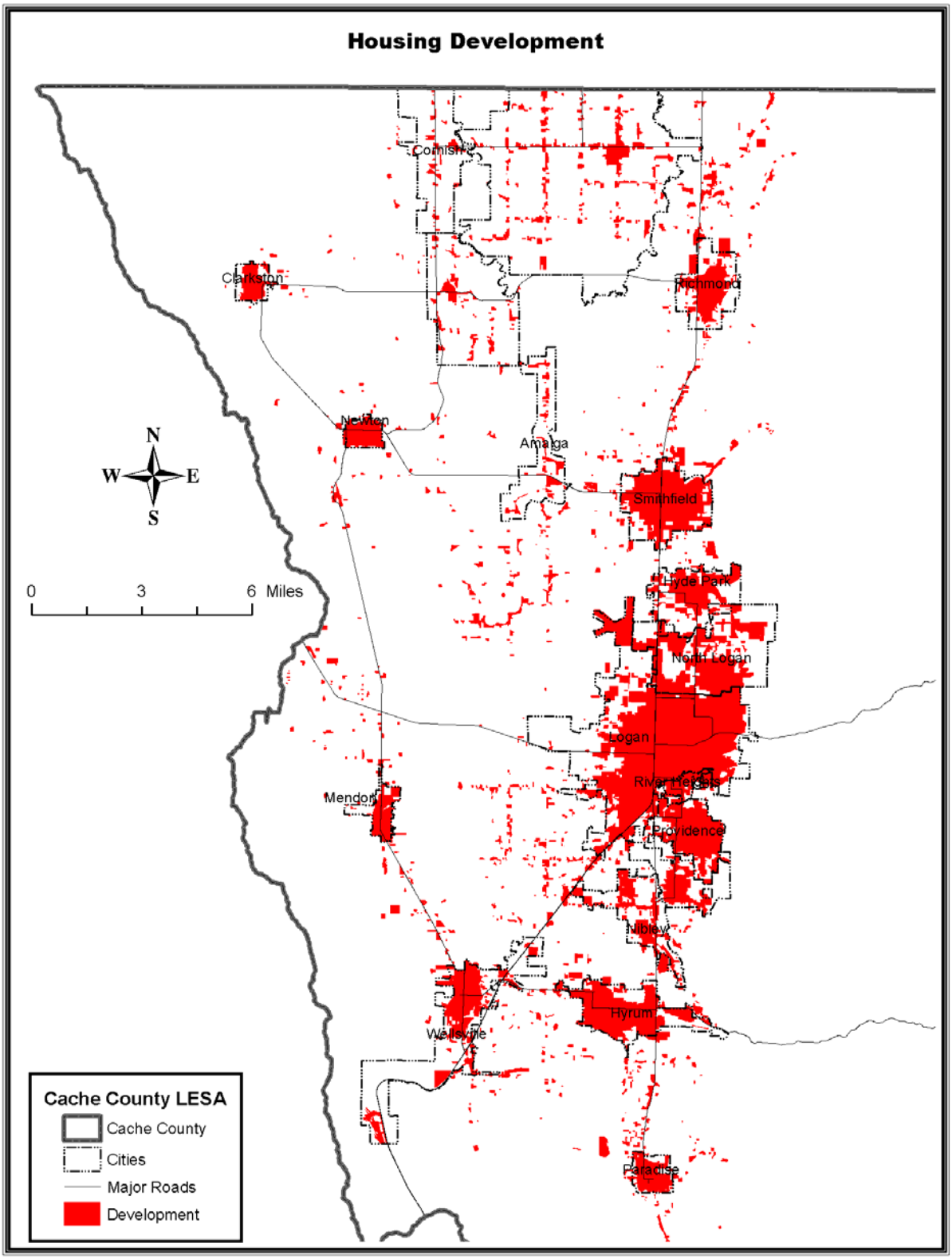


Example 1:
40 acre parcel, 5 houses in buffer
=10 houses per square mile
= 100 points

Example 2:
320 acre parcel, 5 houses in buffer
= 5 houses per square mile
= 75 points

Number of houses with ¼ mile buffer associated with different "housing densities"

Size of parcel	Amount of land within a 1/4 mile buffer	Number of houses in buffer that would create a density of: 5 houses per square mile	10 houses per square mile	25 houses per square mile	50 houses per square mile	100 houses per square mile
40 acres	320 acres (1/2 square mile)	3	5	13	25	50
160acres	480 acres (3/4 square mile)	4	8	19	38	75
320acres	640 acres (1 square mile)	5	10	25	50	100
640acres	800 acres (1.25 square miles)	6	13	31	63	125


Housing Development
Cornish
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River Heights
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Nibley
Hyrum
Wellsville
Paradise
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6 Miles
Cache County LESA
Cache County
Cities
Major Roads
Development

SA-2(c) PROXIMITY TO NEAREST PUBLIC SEWER AREAS

Goal and Rationale:

The LESA committee believes that provision of public sewer services greatly increases the likelihood that a parcel of land will be developed for residential or commercial purposes.

As a result, the third SA-2 factor was designed to assign the maximum points to parcels of agricultural land that lay in a zone that is between ½ to 2 miles from officially recognized public sewered areas. Map SA-2(c) on the next page illustrates the location of these areas.

Parcels that are *farther* than 2 miles from a sewered area were assigned slightly fewer points to reflect the fact that they are less likely to be experiencing significant pressure for nonagricultural development.

Parcels that are *closer* than ½ mile from a sewered area receive diminishing priority for agricultural land protection because the intensity of development pressure makes viable commercial farming less likely.

Agricultural parcels that lie within or immediately adjacent to a publicly sewered area receive no points as they are likely to be facing extreme pressures for housing development in the near future.

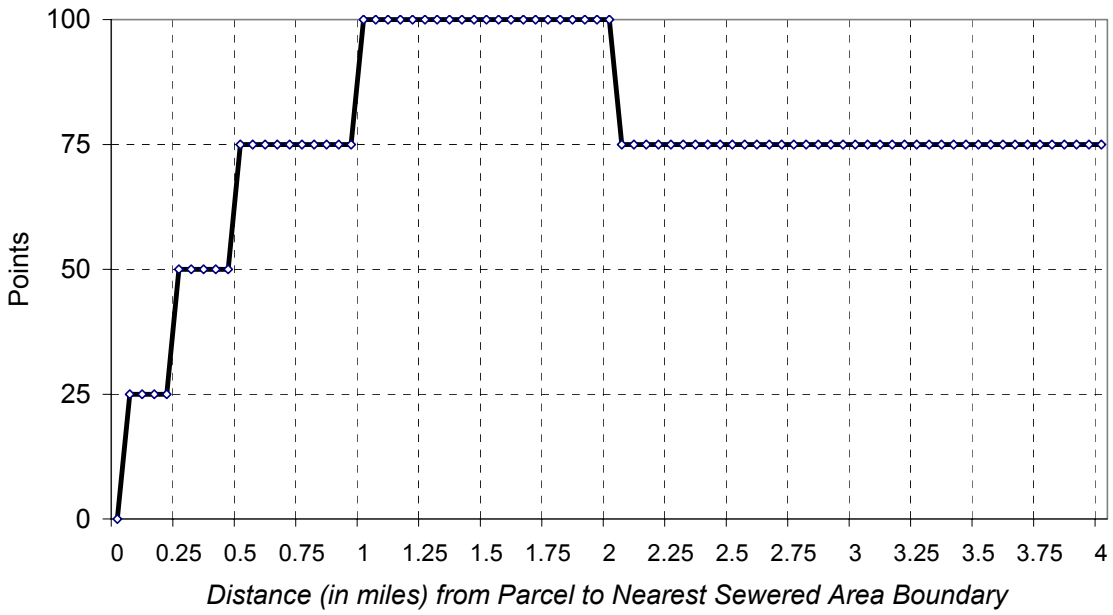
Calculating points:

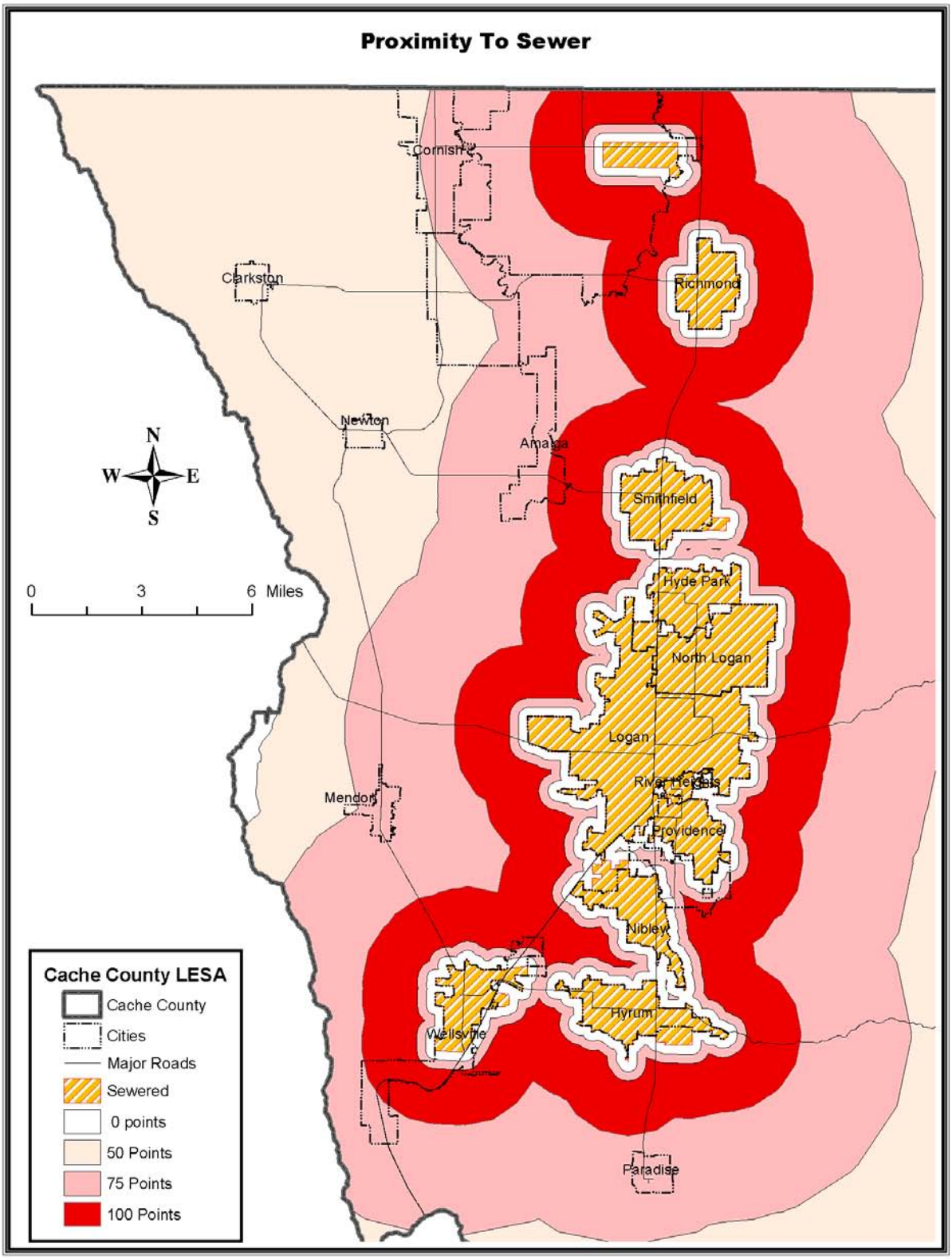
The points assigned to parcels for the SA-2(c) factor are illustrated in the table below.

Points Assigned to the SA2(c) Factor

Distance to Boundary of Nearest Sewered Area	Points
More than 5 miles	50
2 to 5 miles	75
1/2 to 2 mile	100
1/4 to 1/2 mile	75
< 1/4 mile	25
Adjacent	0

Graphic Illustration of LESA SA2(c) Points Associated with Proximity to Sewered Areas




Proximity To Sewer
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North Logan
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River Heights
Providence
Mendon
Nibley
Hyrum
Wellsville
Paradise
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6 Miles
Cache County LESA
Cache County
Cities
Major Roads
Sewered
0 points
50 Points
75 Points
100 Points

SA-3 FACTORS (Protecting Non-Agricultural Resources)

SA-3 factors are designed to capture characteristics of agricultural land that provide non-agricultural benefits to residents of Cache County.

The LESA committee identified two SA-3 factors to use in the LESA scoring system. These reflect the importance of agricultural lands for protecting other natural resource features, and for preserving the rural character of the visual landscape.

SA-3(a) PROTECTING IMPORTANT NATURAL RESOURCE LANDS

Goal and Rationale:

The LESA committee identified five important types of natural resources that can be found within or near agricultural properties. These include:

1. **Floodplains**

   Floodplains are that portion of a river or stream valley, adjacent to the channel, which is built of sediment deposited during the present regimen of the stream and is covered with water when water overflows its banks at flood stages.

   Floodplains are important to preserve in order to prevent flood event disasters. Development in these areas will likely cause adverse impacts to the quality, quantity, and timing of stormwater runoff. Lands that are within 30 meters of floodplains are counted as floodplains for LESA scoring (See map SA-3(a1) for the location of officially-recognized floodplains.)

2. **Wetlands**

   Wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

   In general terms, wetlands can potentially support many important ecological functions, such as providing habitat for fish and wildlife, improving water quality by filtering sediment and nutrients from upland runoff, providing shoreline and streambank stabilization, and providing recreational opportunities such as wildlife viewing and hunting. Residents of Cache Valley derive many benefits from wetlands and desire that these areas be conserved. Lands that are within 30 meters of Weltlands are counted as Wetlands for LESA scoring (See map SA-3(a2) for the location of officially-recognized wetlands.)

3. **Watercourses**

   A watercourse is a natural, well-defined channel produced wholly or in part by a definite flow of water, continuous or intermittent. This also includes primary ditches, canals, aqueducts, or other artificial channels for the conveyance of water (provided they provide riparian habitat along their banks). Lands that are within 30 meters of the bank of a lake, or reservoir and lands within 30 meters of the centerline of a waterway are counted as watercourses for the LESA scoring.

   Watercourses are important to preserve in order to maintain water quality, prevent erosion, and conserve important fish and wildlife habitat. (See map SA-3(a3) for the location of officially-recognized watercourses.)

4. **Groundwater Recharge Zones**

   A groundwater recharge zone is an area where deposits between the land surface and the water table consist of sediments that contain no confining layers, allowing surface water to move from the land surface to an aquifer.

   Many residents in Cache Valley rely on groundwater as their primary domestic water supply source. Development in groundwater recharge zones can cause reduced infiltration and contamination. Groundwater recharge zones are important to preserve as a way to ensure a continued source of reliable and high-quality groundwater for Cache Valley residents. (See map SA-3(a4) for the location of officially-recognized groundwater recharge zones.)

5. **Critical Wildlife Habitat**

   Essential wildlife habitat has been defined as the habitat that the State of Utah must maintain to meet the management objectives and the habitat conservation needs of several species of wildlife in the state. In the Cache County LESA model, these areas include habitat that is critical for the survival of Mule Deer, Elk, Sage Grouse and Sharp-Tailed Grouse

   If these areas are maintained, then it follows that the general wildlife resources in an area are healthy. Residents of Cache Valley feel strongly about conserving essential wildlife habitats for the continued use and enjoyment of wildlife through viewing and/or consumption. Development in these areas may jeopardize the continued health of specific wildlife populations. (See map SA-3(a5) for the location of officially-recognized critical wildlife habitat.)

The SA-3(a) factor is designed to capture the extent and amount of important natural resource lands that are within and/or adjacent to the proposed parcel. The committee believed that the community as a whole benefits from protecting these important natural resources.

As a result, they decided that agricultural lands that contain such resources within their boundaries should be assigned increased priority in the LESA evaluation process. Total points reflect the number and acreage of each type of important natural resource land.

Agricultural lands that are immediately adjacent to large blocks of important natural resource lands are also assigned additional points in the LESA analysis, though at a lower rate.

Calculating Points:

The LESA committee staff will compile and periodically revised current maps of the location and extent of the five natural resource features listed above. To determine the SA-3(a) points to assign to a parcel, an analysis will be conducted to determine the amount of acreage within the proposed protected parcel for each of the five types of important NR lands listed above. Then, the total acres of contiguous important NR lands (of any type) that are immediately adjacent to the proposed parcel will be identified.

Depending on the composition of the lands in (or adjacent to) the parcel, the proposal receives up to 100 points by using the following formula:

Points = W + A, where

W = Acres of NR lands within proposed parcel ***** # points for each type of important natural resource

A = Acres of NR lands (with any # of attributes) that are immediately adjacent and contiguous to the proposed parcel. (*Maximum points from adjacent lands = 50*).

Parcels can receive a maximum score of 100 points, with no more than 50 total points coming from adjacent lands.

EXAMPLES:

Ex.1) If a 40 acre parcel has 10 acres of NR lands with 4 features present, 10 acres with 1 feature present, and no adjacent NR lands,

W = (10 * 4) + (10 * 1) = 50 points.
A = 0 points
P = W + A = 50 + 0 = **50 total points**

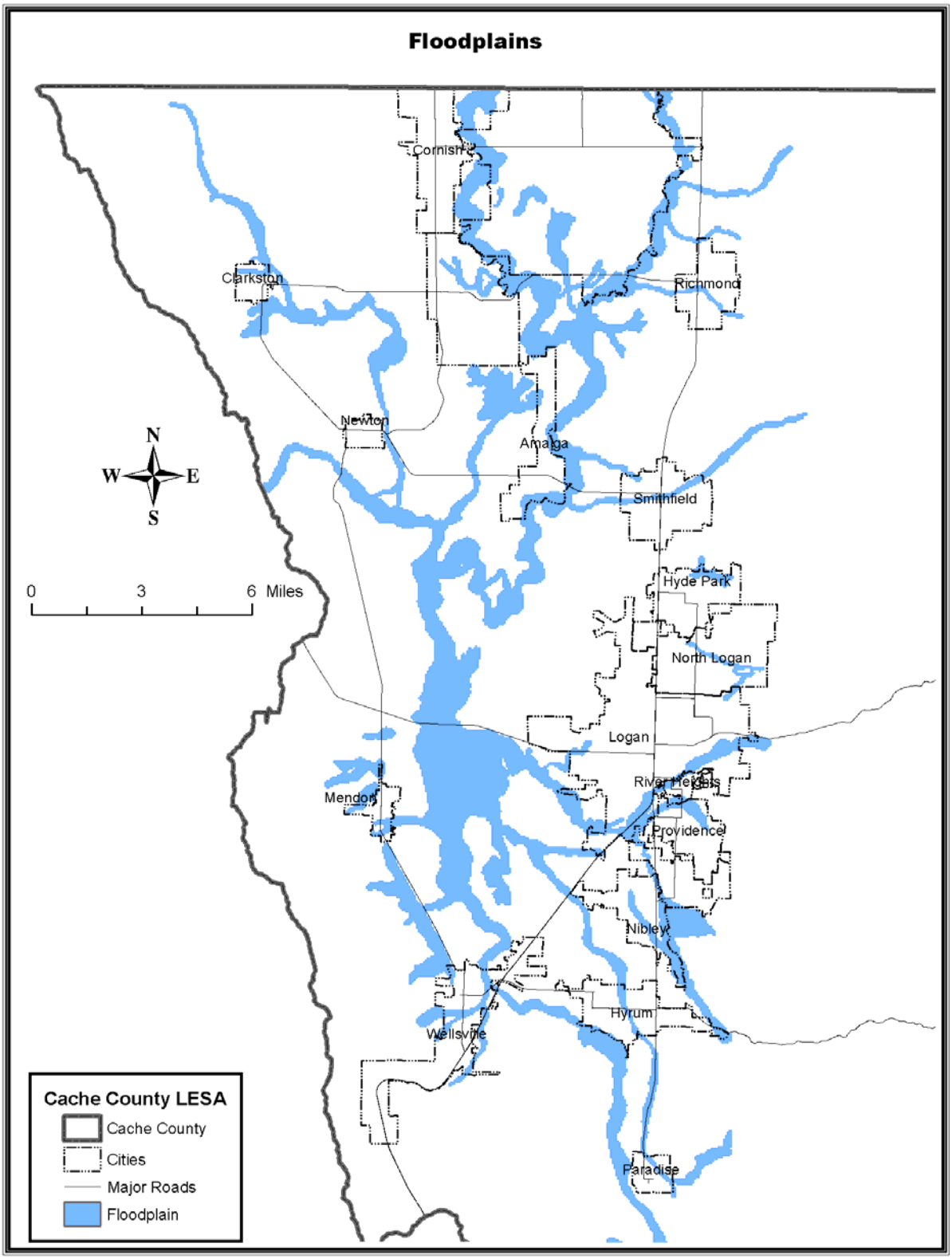
Ex.2) If a 100 acre parcel has 40 acres of NR lands with 2 features present, and is adjacent to a contiguous block of 20 acres of NR lands with 2 features present,

W = (40 * 2) = 80 points
A = 20 * 2 = 20 points *(1 pt per acre regardless of # of features)*
P = W + A = 80 + 20 = **100 total points**

Ex.3) If a proposed parcel has NO acres of NR lands within its boundaries, but is adjacent to a contiguous block of 200 acres of contiguous important NR lands with 1 feature present, it receives

W = 0 points
A = 200*1 = 50 points *(maximum for adjacent lands)*
P = W + A = 0 + 50 = **50 total points**

A composite map of the combined presence of each of the five Natural Resource features in Cache County is shown below (see map SA-3 combined)


Floodplains
Cornish
Clarkston
Richmond
Newton
Amalga
Smithfield
Hyde Park
North Logan
Logan
River Heights
Mendon
Providence
Nibley
Hyrum
Wellsville
Paradise
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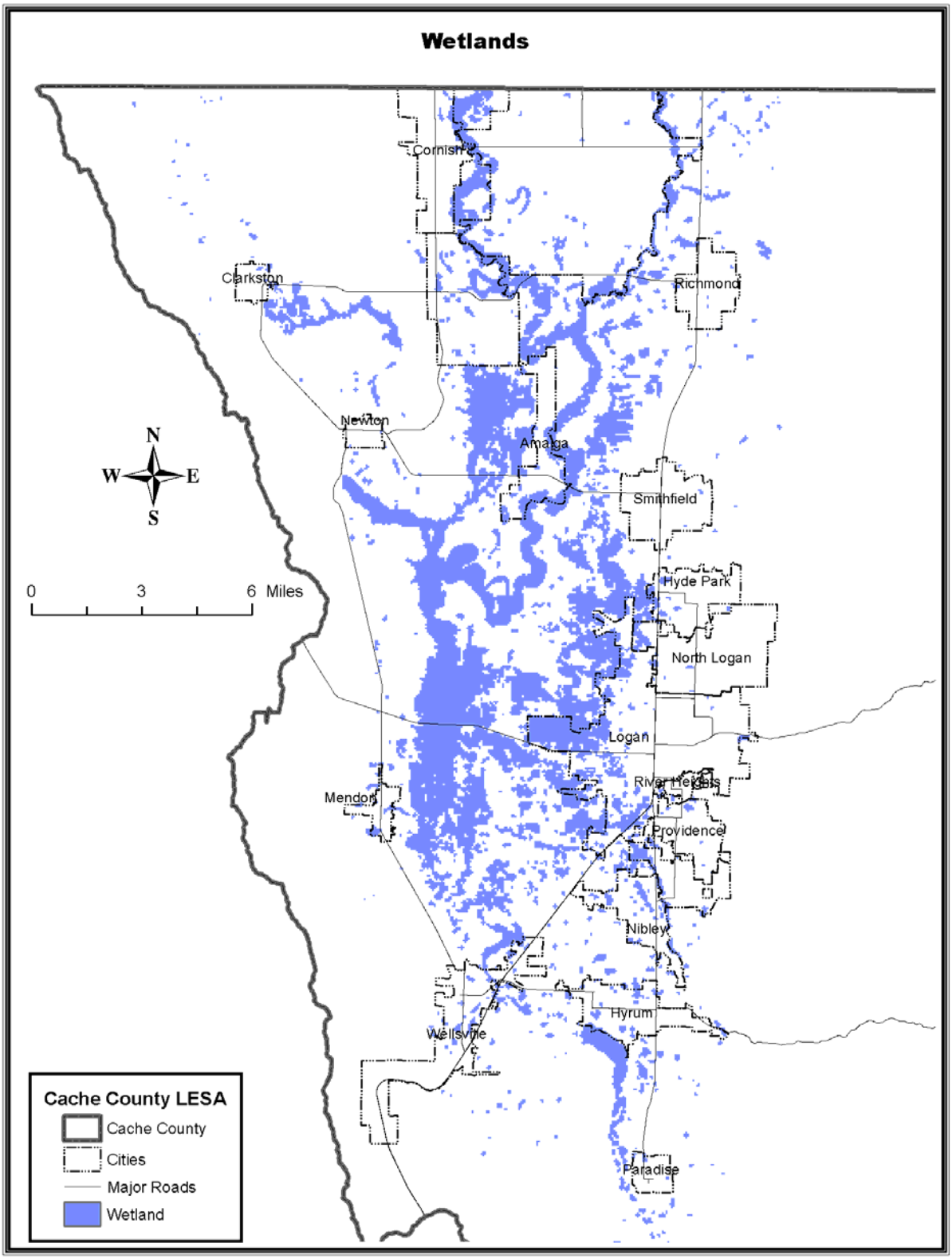
6 Miles
Cache County LESA
Cache County
Cities
Major Roads
Floodplain


Wetlands
Cornish
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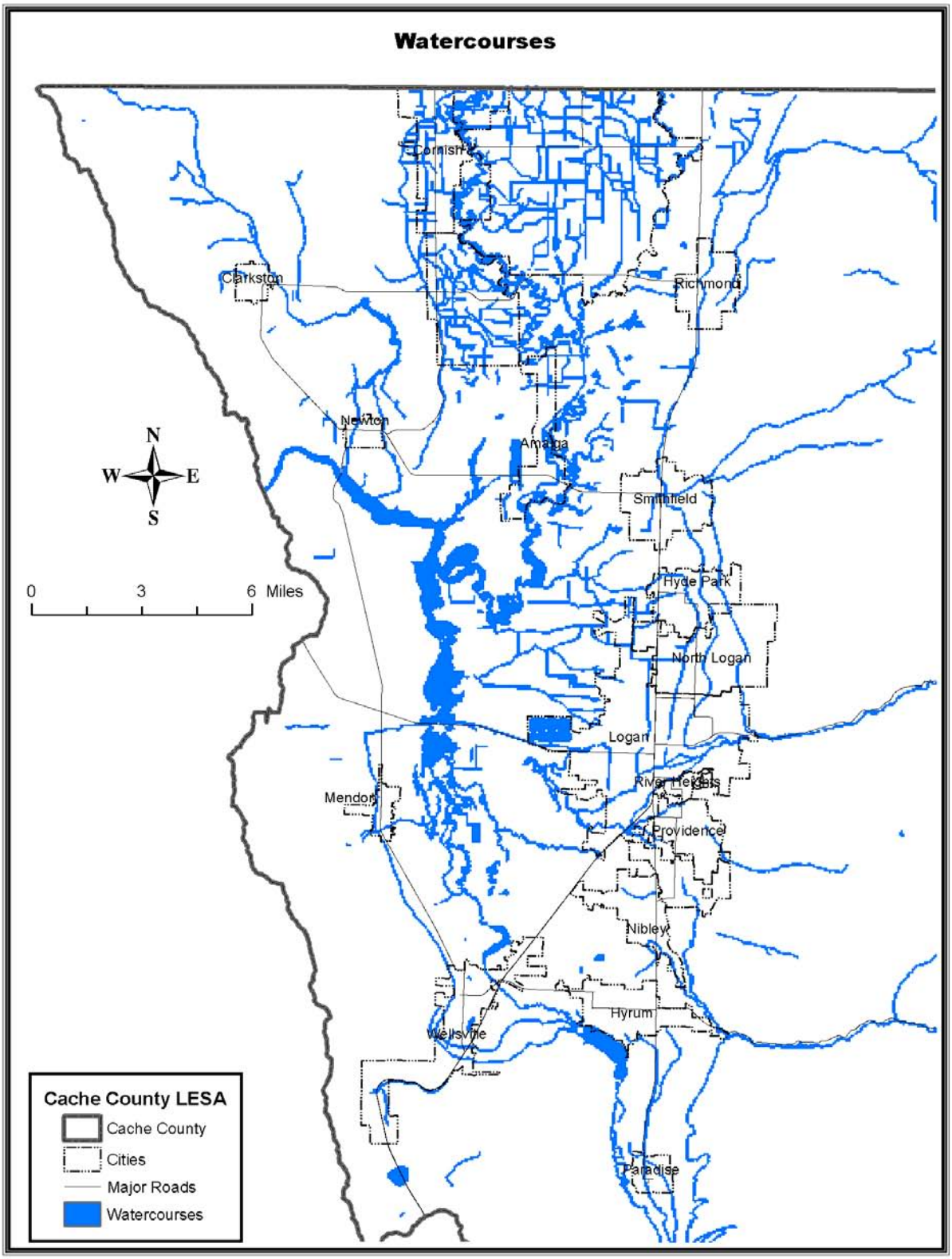
Cache County LESA
Cache County
Cities
Major Roads
Wetland


Watercourses
Cornish
Clarkston
Richmond
Newton
Amalga
Smithfield
Hyde Park
North Logan
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River Heights
Mendon
Providence
Nibley
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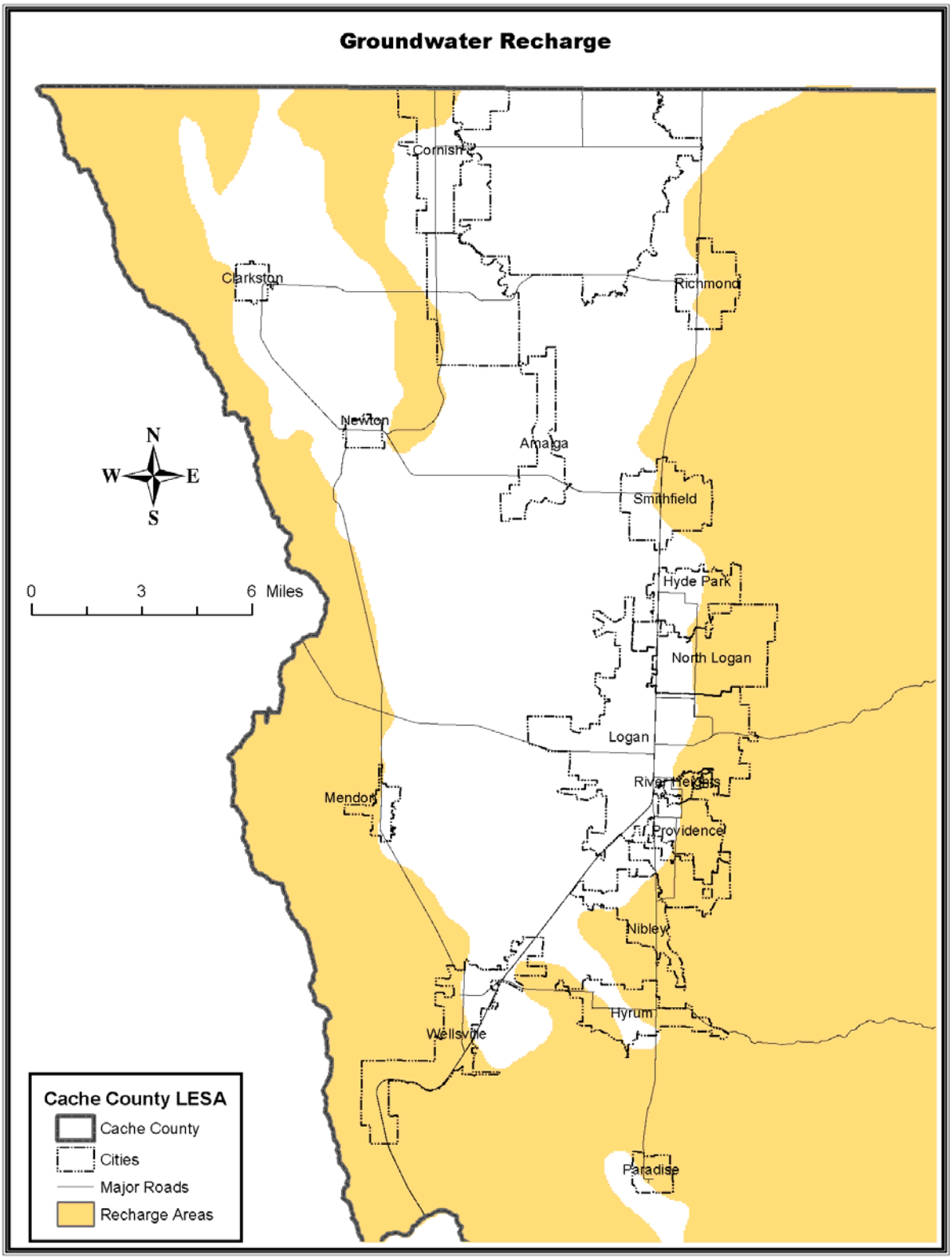
Cache County LESA
Cache County
Cities
Major Roads
Watercourses


Groundwater Recharge
Cornish
Clarkston
Richmond
Newton
Amalga
Smithfield
Hyde Park
North Logan
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River Heights
Mendon
Providence
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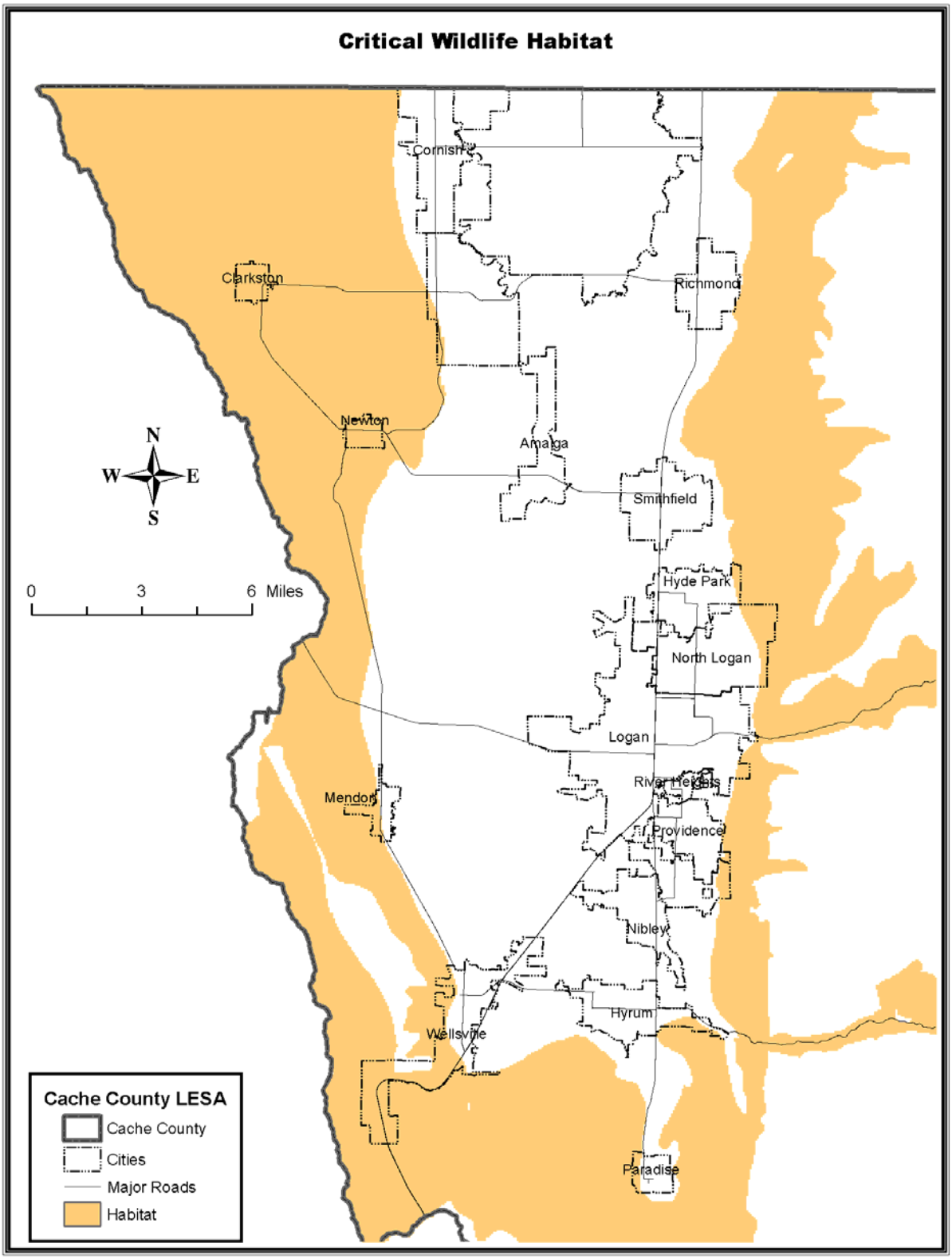
Cache County LESA
Cache County
Cities
Major Roads
Recharge Areas


Critical Wildlife Habitat
Cornish
Clarkston
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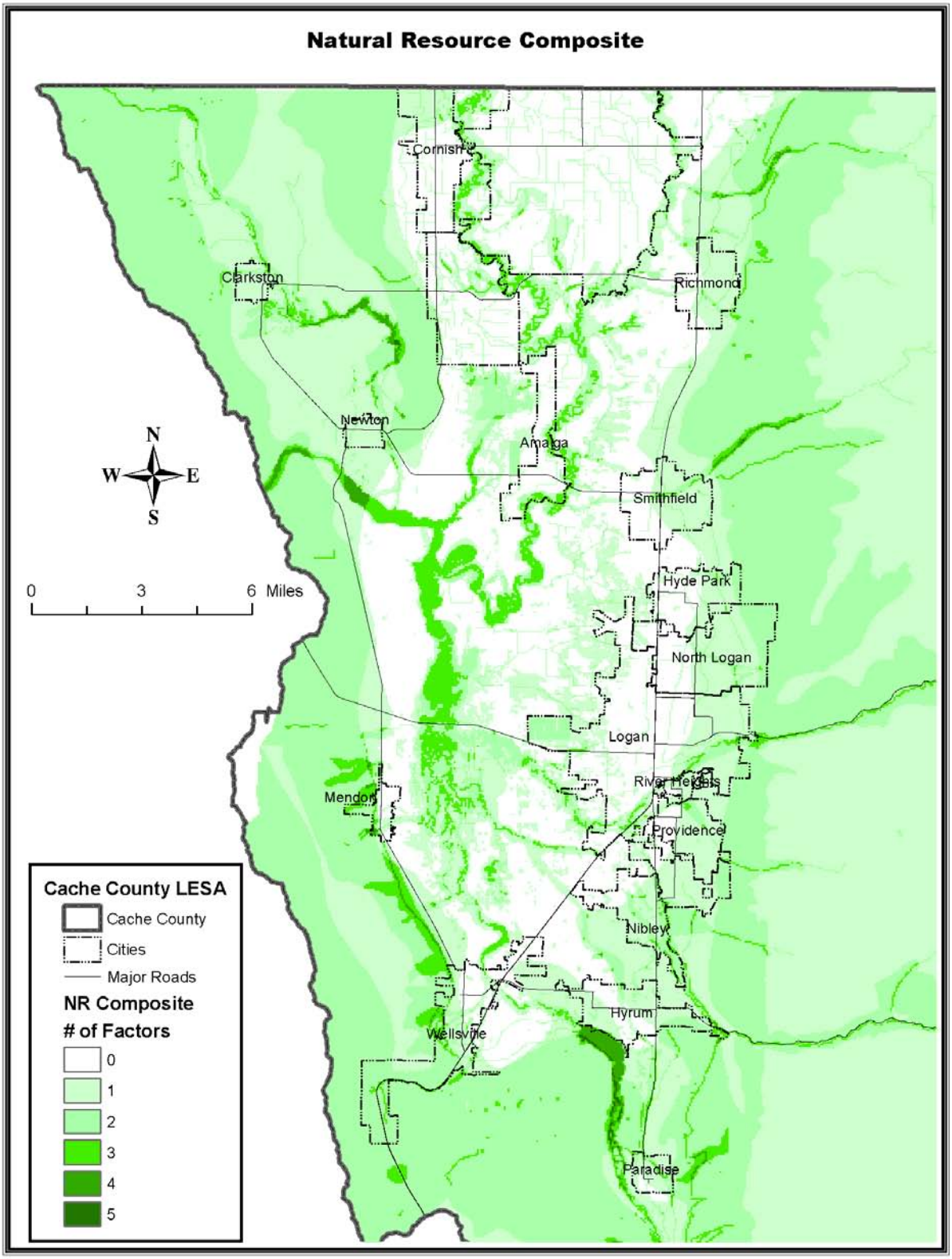
Cache County LESA
Cache County
Cities
Major Roads
Habitat


Natural Resource Composite
Cornish
Clarkston
Richmond
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Smithfield
Hyde Park
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River Heights
Mendon
Providence
Nibley
Hyrum
Wellsville
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Cache County
Cities
Major Roads
NR Composite
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5

SA-3(b) PROTECTING THE RURAL VISUAL LANDSCAPE

Goal and Rationale:

Repeated surveys and considerable anecdotal evidence suggests that the rural, agricultural 'look' of Cache County is very important to the quality of life for current residents (and in a crucial factor in attracting future growth and development to the valley).

This SA-3(b) factor was designed by the LESA committee to capture a number of attributes that might make a parcel attractive as a means for protecting the views of the rural Cache Valley landscape.

The committee decided to assign points to proposed parcels based on how much they contribute to three distinct components of the visual landscape:

1. Lands in the "foreground" view, as seen from major traffic corridors,
2. Lands above 4,800 feet elevation (roughly the Provo level of the former Lake Bonneville, which can easily be seen from most parts of the valley), and
3. Lands that are important to the larger "viewshed" as seen from key entry points around the valley.

Calculating points:

Points for this factor will be assigned by adding together the values associated with three separate components. The total number of points for this factor cannot exceed 100 points.

1. Road Corridors

To protect the foreground visual landscape, a ½ mile buffer was drawn in either direction from each of the major roadways in Cache County. Agricultural parcels that are within ½ mile of the most frequently traveled roads (including all federal highways and state roads in the county) are assigned the highest priority. Parcels close to other important roads are assigned diminishing points for this factor. See appendix map SA-3(b1) for the scores given for the road corridors

Points associated with lands within ½ mile of the following types of roads will include:

CLASS 1 Roads (federal and state roads)	**100 pts**
CLASS 2 Roads (minor state and major county)	**75 pts**
CLASS 3 Roads (county connecting roads)	**50 pts**

2. Benchland Protection

All proposed parcels that include privately owned agricultural lands that are above the Provo level of the former Lake Bonneville (defined as 4,800 foot elevation level) will be assigned 100 points under this factor. See map SA-3(b2) for a graphic illustration of the location of the bench areas above 4,800 feet.

3. Viewshed Analysis

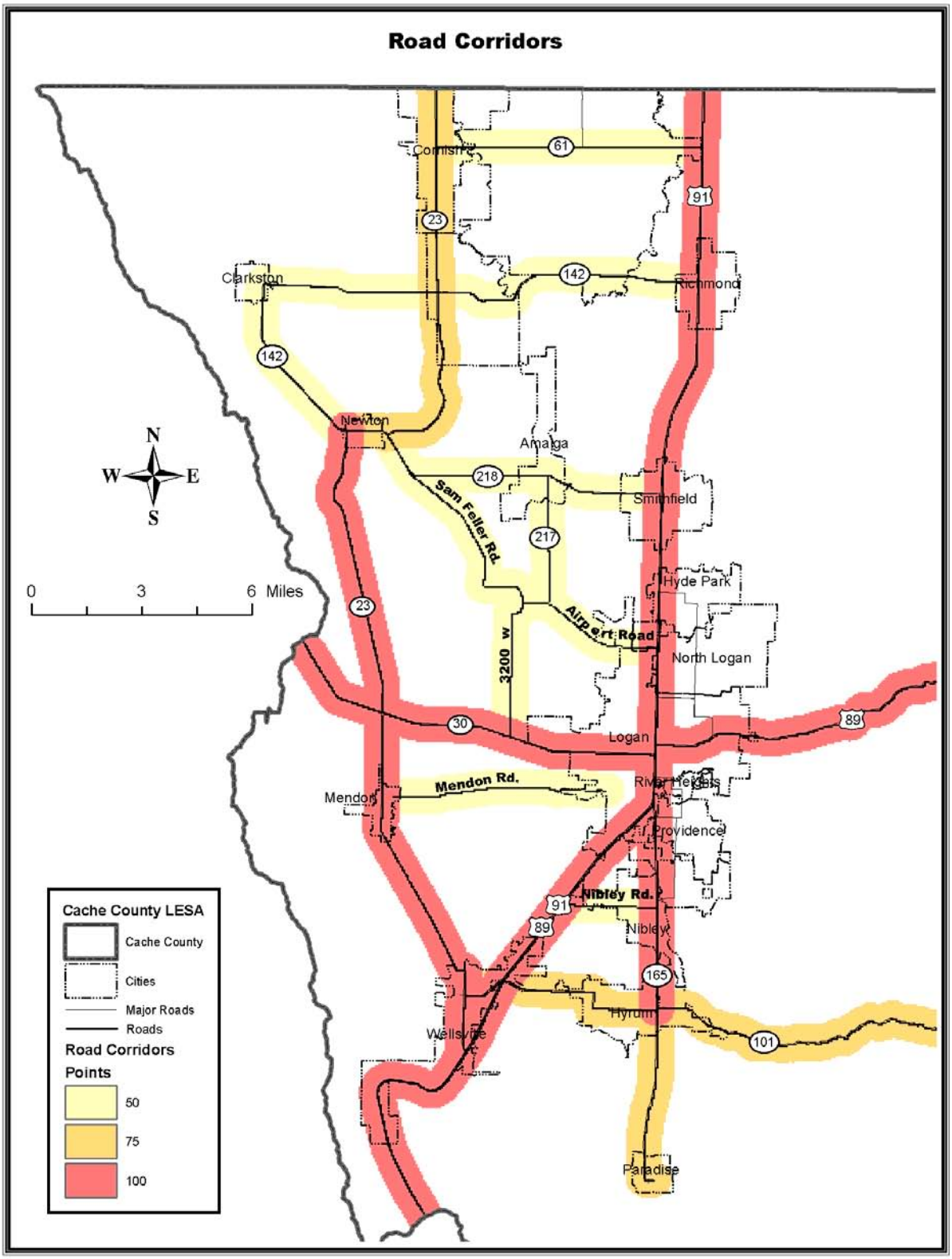
Finally, all private lands below 4,800' elevation will receive a score depending on whether they can be seen from 6 key observation points (KOPs) in the valley. These KOPs include:

i) The entryway into the valley at the mouth of Wellsville canyon;
ii) The first full view of the valley along Highway 30 heading east from Box Elder county (roughly 1.2 miles from county border);
iii) The view from Highway 89 heading west from Logan canyon, just before the road drops down around the USU campus (roughly at 900 E.);
iv) The view from Highway 91 just south of the Idaho border.
v) The view from Highway 91 north of Smithfield where the road traverses the side of Crow Mountain;
vi) The view from the rise along Highway 165 just north of Hyrum;
vii) The view from the visitor center at the American West Heritage Center;

The map SA-3(b3) shows the location of the seven KOPs and the resulting number of times various farmland parcels can be seen from these points. A score is given to a parcel depending on how often a particular location can be seen from these specific points, based on the following scale:

Seen from < 1 major viewpoint	**=**	**0 points**
Seen from 1 major viewpoint	**=**	**25 points**
Seen from 2 major viewpoints	**=**	**50 points**
Seen from 3 major viewpoints	**=**	**75 points**
Seen from 4 or more major viewpoints	**=**	**100 points**

Total scores for the overall factor will be the sum of the three components and cannot exceed 100 points. A map that includes the composite of all three visual landscape components is shown below.


Road Corridors
Cornish
61
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23
Clarkston
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Richmond
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Newton
Amalga
218
Smithfield
Sam Feller Rd.
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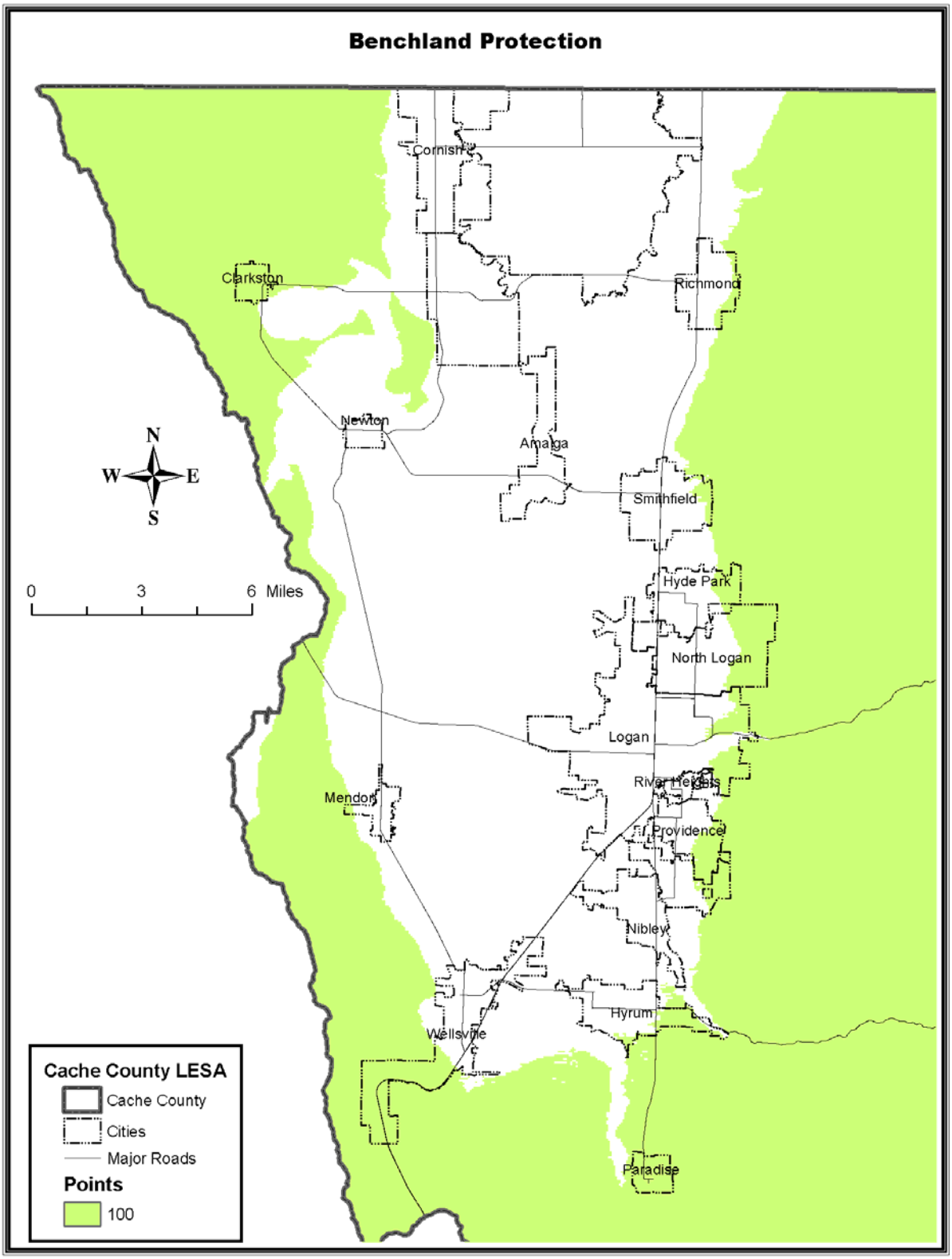
Benchland Protection
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Cache County
Cities
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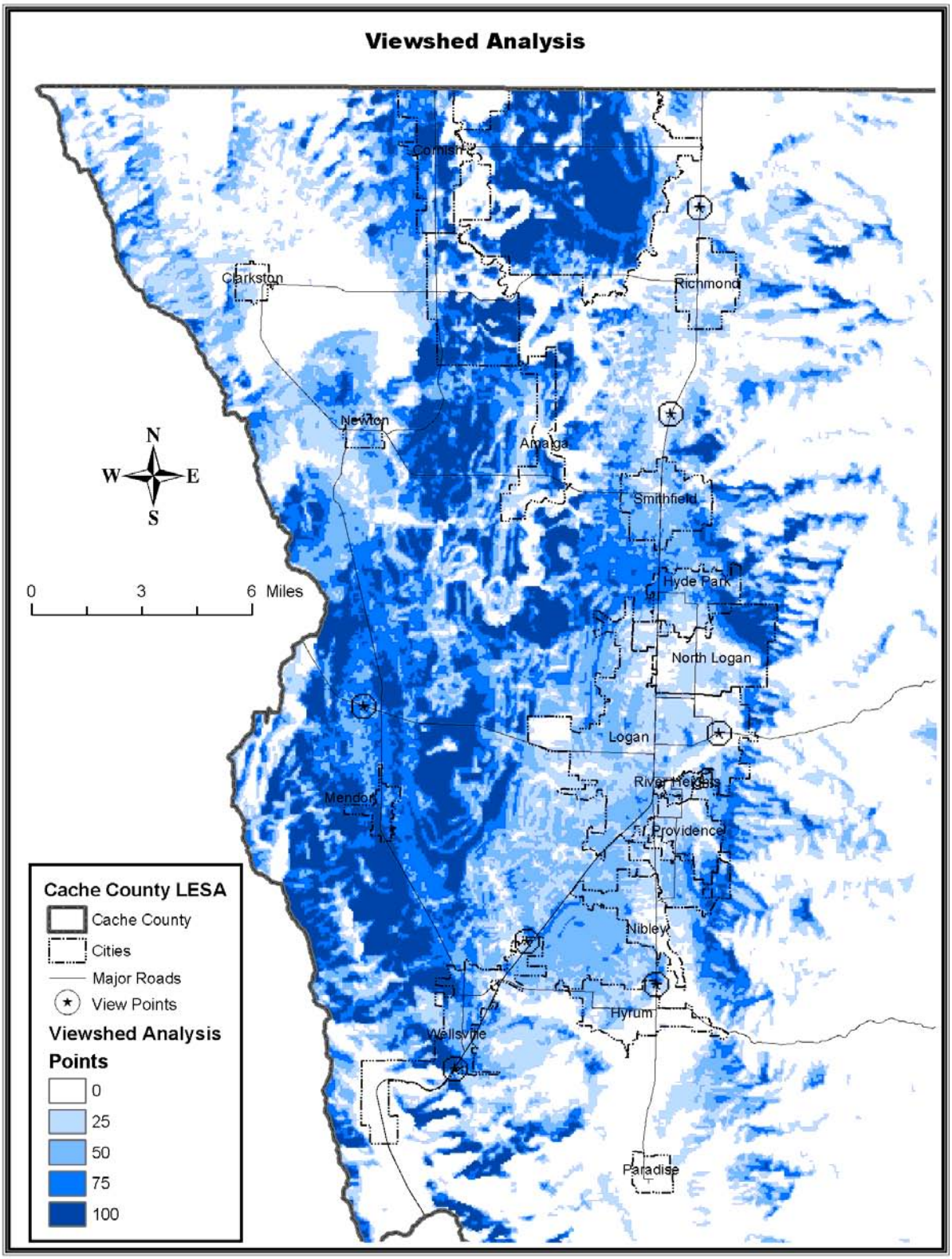
Viewshed Analysis
Cornish
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Cache County LESA
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Major Roads
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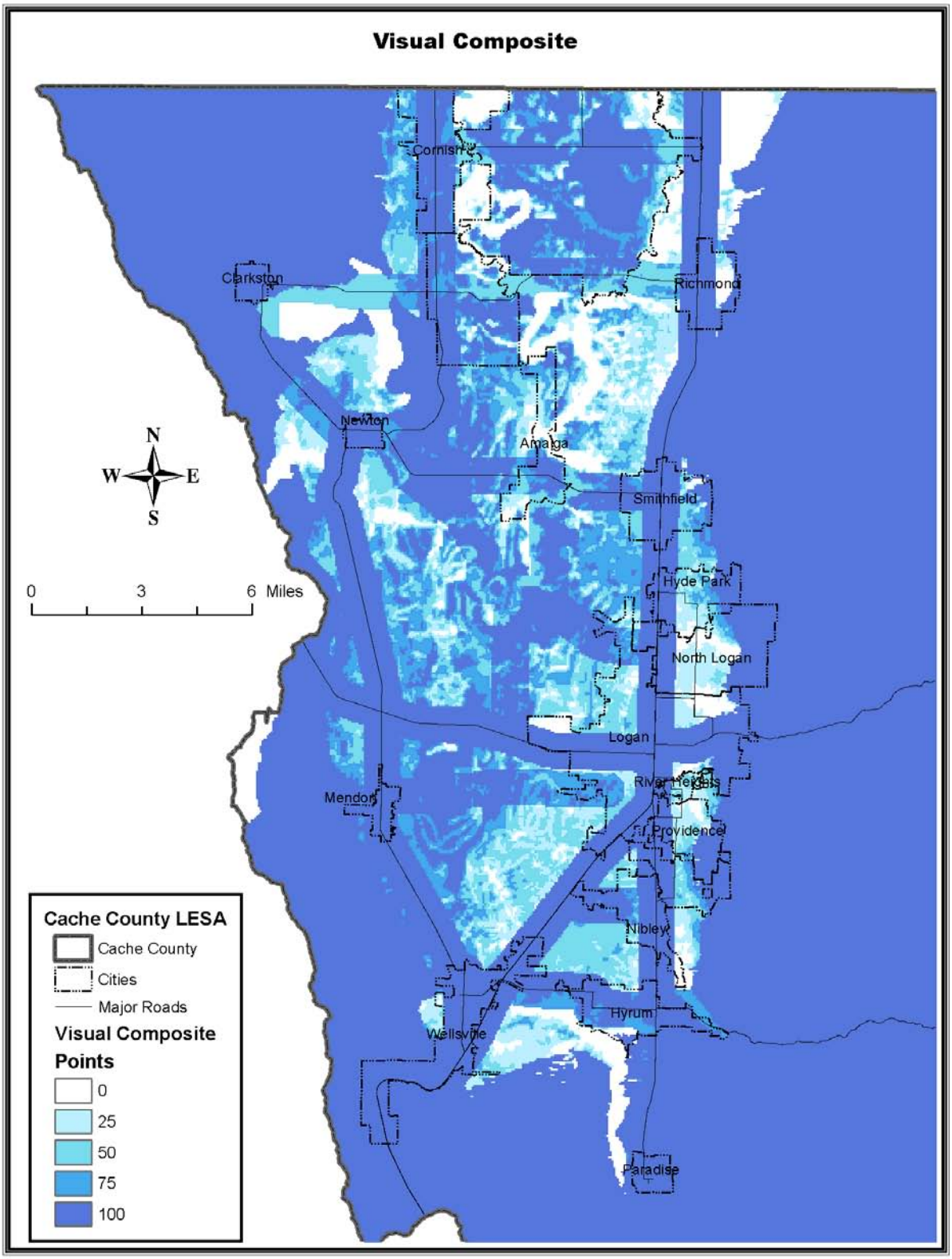
Visual Composite
Cornish
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River Heights
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Hyrum
Wellsville
Paradise
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6 Miles
Cache County LESA
Cache County
Cities
Major Roads
Visual Composite Points
0
25
50
75
100

WEIGHTING THE COMPONENTS OF THE LESA FORMULA

Goals and Rationale:

The LESA committee solicited input from all its members regarding the relative weights that should be placed on the various LE and SA components. The mean values assigned to each category were then used to develop the overall LESA score for a parcel.

The committee determined that the Land Evaluation scores for a parcel should be worth 43 percent of the total LESA score (22 percent for the Soil Productivity Index score, and 21 percent for the Land Classification Score).

This reflects their belief that the relative quality of soils for agricultural production is one of the most important considerations when comparing agricultural parcels that are proposed for agricultural preservation.

The committee assigned 57 percent of the total LESA score to the various SA components.

Of this, 22 percent was for the two SA-1 factors; 18 percent was for the three SA-2 factors, and 17 percent for the two SA-3 factors.

These proportions reflect the belief that lands that are more likely to support commercial agricultural operations (beyond their soil attributes) should receive higher priority in the LESA ranking system.

Roughly equal weight was placed on the importance of protecting lands that are experiencing moderate levels of development pressure and on lands that help preserve environmental quality and the visual landscape.

Calculating the Total LESA score

The various LE and SA components of the LESA formula will be combined by assigning weights to each component. The relative importance of each component is illustrated in the table below.

I)	**LE (Land Evaluation Components)**	
	1. Soil Productivity Index (SPI)	22 pts
	2. Land Capability Index (LCI)	21 pts
II)	**SA (Site Assessment Components)**	
	1. **SA-1** (farming potential)	
	(a) Size of Parcel	14 pts
	(b) Commercial Farm Activity	8 pts
	2. **SA-2** (development pressure/threats)	
	(a) Proximity to protected lands	8 pts
	(b) Proximity to public sewer area	5 pts
	(c) Density of housing development	5 pts
	3. **SA-3** (other non-ag goals)	
	(a) Natural Resource Lands	9 pts
	(b) Visual Landscape Protection	8 pt
	TOTAL:	100 points

The precise computational formula that will be used will be:

LESA score = LE(a)*.22 + LE(b)*.21
+ SA1(a)*.14 + SA1(b)*.08
+ SA2(a)*.08 + SA2(b)*.05) + SA2(c)*.05
+ SA3(a)*.09 + SA3(b)*.08

APPENDIX 1: Technical Information about Data Used in LESA Scoring and Associated GIS Maps

This section provides technical background for the maps used in this guide. It includes a description of the components that make up the map, who created the data set, who is responsible for maintaining it, and the date the data set was completed. Note that these spatial data layers are used for the initial calculation of scores for many of the LESA equation components.

LAND EVALUATION

MAP LE-1 Soil Productivity Index and MAP LE-2 Land Capability Index

Both the Soil Productivity Index and the Land Capability Index are based on the Soil Survey Geographic (SSURGO) surveys completed in 1974 by the US Department of Agriculture Soil Conservation Service. In the survey, soil types of 10 acres or greater were delineated on paper maps. GIS data representing the1974survey became available in 1999. This data base is the most detailed of several Natural Resource Conservation Service (NRCS) soil surveys and is intended to be used by property owner as well as by local and county agencies to help make land-use planning decisions.

For each soil map unit in the SSURGO database, a Soil Productivity Index score between 0 and 100 has been assigned. The SPI score is based on estimated potential yields of non-irrigated corn or hay. The estimated yield potential reflects the best scientific estimate of the ability of the soil to produce commonly grown crop, holding management ability or conditions constant.

Land Capability Class groups soil units into eight classes of land designated by Roman numerals I thru VIII. The first four classes are arable land The remaining four classes, V thru VIII, are not crop land, but may have uses for pasture, range, woodland, grazing, wildlife, recreation, and esthetic purposes. Scores for the LCC are derived from the table on page 4 of the LESA handbook

SITE ASSESSMENT

SA-2(a) Proximity to Protected Lands

1. **Conservation Easements**- This data set represents all the lands that were in conservation easements in 2001. It was created by the Countywide Planning and Development Office.
2. **Agriculture Protection Areas (APAs)-** Represents the farm parcels that have applied for and been accepted into protected agriculture status as of February 2002. The list of farms under protection in APA's is maintained by Pat Parker in the Cache County Executive Office.
3. **Public Lands**- This layer consists of all lands classified as Forest Service, Bureau of Reclamation, State, State Parks, or State Wildlife Reserves. It is derived from the ownership layer created by Utah State University, published in 1993 and distributed by the State of Utah's Automated Geographic Reference Center (AGRC).
4. **Utah Power**- Lands owned and operated by Utah Power and Light. The layer is derived from the 2001 Cache County parcel map by selecting all parcels labeled as "Utah Power & Light Company" in the name filed of the data set.

SA-2(b) Housing Development

1. **Developed Lands**- Lands considered developed from a study conducted by the USDA Conservation District in 2001 to calculate the amount of Farmland lost to urban expansion in Cache County. Development was determined using aerial photographs, Cache County building permits and the State of Utah Water Related Land Use data. The Countywide Planning and Development Office maintains this data set
2. **Developed Parcels**- The Cache County parcel map overlaid with the developed lands. All parcels with development occurring somewhere within its boundary are considered developed for this analysis.

SA-2(c) Proximity to Sewer

1. **Sewered Area**- This data set represents the areas of the county that are served by a public sewer system as of May 2002. An area is considered sewered if it falls within a the boundary of a city that maintains a sewer system. The sewered areas will then change as often as the city boundaries change due to annexation, The city boundary GIS data set is maintained by the Countywide Planning and Development Office on a regular basis.
2. **Sewer Buffers**- Based on the sewered areas layer. Four buffers were expanded from the edge of the sewered a distance of 0.25, 0.50, 2.0, and 5.0 miles.

SA-3(a1) Natural Resource Lands (Floodplains)

Floodplains- This data set represents the areas declared by Federal Emergency Management Agency (FEMA) as 100 year floodplains. It was produced by the AGRC as part of the Cache County Comprehensive plan.

SA-3(a2) Natural Resource Lands (Wetlands)

Wetlands- This data set represents wetland areas as delineated by the National Wetlands Inventory (NWI) conducted by the U. S. Fish and Wildlife Service. The GIS data was published in 2001 and made available from the AGRC. In the final map all wetlands are buffered 30 meters from the bank.

SA-3(a2) Natural Resource Lands (Watercourses)

Watercourses-This data set represents perennial streams and canals. The data was digitized by the AGRC in 1990 from 7.5 minute USGS topographic Quads. The data is made available from the AGRC. The final data used in the map includes a 30 meter buffer from the centerline of the streams and canals.

Lakes- This data set represents bodies of water as delineated by the U.S. Census Bureau created by the Topographically Integrated Geographic Encoding and Referencing system (TIGER). This data is made available by the AGRC. The final data used in the map includes a 30 meter buffer from the shoreline of the lakes.

SA-3(a4) Natural Resource Lands(Groundwater Recharge)

Groundwater recharge areas are those areas where surface water infiltrates through the soil into the underground water supply. This map includes both primary and secondary recharge areas of Cache County. The data set was produced in 1993 as part of a larger geologic survey of Cache County by the U.S. Geological Survey.

SA-3(a5) Natural Resource Lands(Critical Wildlife Habitat)

This map represents the combined habitat of four important wildlife species found in Cache County. Any location designated as habitat on the map is considered habitat for at least one species of wildlife by Utah's Department of Wildlife Resources (UDWR).

Deer Habitat: Deer habitat was published in 2003 by UDWR. For the LESA analysis habitat of critical and high values are included. The UDWR defines critical habitat as- "an area that provides for biological and/or behavioral requisites necessary to sustain the existence and/or perpetuation" of the population. High is "an area that provides for "intensive" use" by the species.

Elk Habitat: Elk habitat was published in 2003 by UDWR. For the LESA analysis habitat of critical and high value are included.

Sage Grouse: This data set represents all lands used by Sage Grouse for brooding as determined by UDWR field biologists in spring 1999.

Sharp-tailed Grouse: This data set represents sharp-tailed grouse distribution in Utah as determined by UDWR field biologists in 1999.

SA-3(b1) Rural Visual Landscape (Road Corridors)

Road Corridors: A select set of the main transportation corridors through the County. Routes were selected by the LESA Subcommittee based on best judgement and include Federal, State, and County roads. The selected roads are buffered 0.50 miles from the centerline and assigned 50, 75, or 100 points.

SA-3(b2) Rural Visual Landscape (Benchland Protection)

Benchlands: The Benchlands are defined as lands above an elevation of 4,800 feet. The 4800' contour was chosen to represent the shoreline of the historic Lake Bonneville. It also corresponds with a level that can be seen fairly easily from most parts of the valley. This data set was derived from a Digital Elevation Model (DEM) compiled from the AGRC. The DEM is a grid-like representation of the Earths surface where the landscape is divided into 30 meter squares (grid-cell) and the average elevation of that area is assigned to the grid-cells. In this manner the topography of the landscape can be modeled within a computer.

SA-3(b3) Rural Visual Landscape (Viewshed Analysis)

View Points: Six key observation points (KOP) at locations which allow significant views of Cache Valley. It is from these points that the computer will determine what lands can and can't be seen.

Viewshed Analysis: For each of the six KOPs, the computer takes a 360º look across the digital elevation model to determine what is visible from the point. The process accounts for topographical features such as hills and valleys, but not for objects like trees and houses.

APPENDIX 2: Table of Soil Mapping Unit Attributes (for LE scoring)

The tables on the following pages present the estimated soil productivity potential and land capability index scores for each of the soil mapping units found in Cache County. This table was used in a geographic information system to produce the maps found on pages 8-9 of this handbook.

map sym	soil name	slope	land Cap.	Lnd Cap. Index	Prod. Equivalent	prd index	if	# acres	% acres
AAE	agassiz very cobbly silt loam	6-30	7s	26	0.70	28	0	2,927	0.6
AAG2	agassiz very cobbly silt loam	30-70	7s	26	0.70	28	0	1,817	0.3
ABG2	agassiz-bradshaw association	30-70	7s	26	0.70	28	0	9,508	1.8
ADG2	agassiz-dateman association	30-70	7s	26	0.70	28	0	14,318	2.7
AEG2	agassiz-elwood association	30-70	7s	26	0.70	28	0	2,717	0.5
AGE	agassiz-goring association	6-30	7s	26	0.70	28	0	1,548	0.3
AGG2	agassiz-goring association	30-70	7s	26	0.70	28	0	1,444	0.3
AhA	airport silt loam	0- 3	6w	38	1.50	60	L	1,892	0.4
Ak	airport silty clay loam	0- 3	6w	38	1.50	60	L	1,473	0.3
Am	airport-salt lake complex	0- 1	6w	38	1.10	44	L	1,488	0.3
AND	ant flat loam	6-20	6e	30	1.30	52	0	7,380	1.4
AOE2	ant flat-despain association	6-30	6e	30	1.60	64	0	5,232	1.0
ArA	avon silty clay loam	0- 3	2e	100	2.50	100	P	3,383	0.6
ArB	avon silty clay loam	3- 6	2e	100	2.50	100	P	2,064	0.4
ArC	avon silty clay loam	6-10	3e	94	2.00	80	S	1,000	0.2
ArD	avon silty clay loam	10-20	4e	75	2.00	80	L	537	0.1
AsC	avon-collinston complex	6-10	3e	94	1.84	74	S	1,274	0.2
AsE	avon-collinston complex	10-30	4e	56	1.58	63	0	1,123	0.2
BAF	barfuss-leatham association	30-50	7e	23	1.30	52	0	8,019	1.5
BcA	battle creek silty clay loam	0- 2	3s	100	2.00	80	P	1,562	0.3
BcD	battle creek silty clay loam	8-15	4e	75	2.00	80	L	580	0.1
BGG	bickmore gravelly silt loam	30-70	7e	23		0	0	747	0.1
BKG2	bickmore-agassiz association	30-80	7e	23	0	0	0	1,338	0.3
BLG2	bickmore-sheep creek associat	30-70	7e	23	0	0	0	8,423	1.6
BmB	blackrock gravelly loam	3- 6	3e	100	2.00	80	P	223	0.0
BmC	blackrock gravelly loam	6-10	3e	94	1.70	68	S	394	0.1
BmD	blackrock gravelly loam	10-20	4e	75	1.50	60	L	469	0.1
BnD	blackrock stony loam	10-20	7s	26	1.00	40	0	393	0.1
BSG2	bradshaw-agassiz association	30-70	8w	0	0.90	36	0	5,012	1.0
Ca	cache silty clay	0- 1	8w	0		0	0	1,613	0.3
Cd	cardon silty clay	0- 3	4w	77	1.80	72	S	2,185	0.4
CE	center creek silt loam	1- 3	4w	70	1.80	72	L	337	0.1
CFE	clegg silt loam	20-30	6e	30	1.30	52	0	805	0.2
CGE	cluff silt loam	6-30	6e	30	0	0	0	1,091	0.2
CHE	cluff-lucky star association	6-30	6e	40	0	0	0	1,968	0.4
CIE	cluff-scout association	6-40	6e	40	0	0	0	3,830	0.7
Ck	collett silty clay loam	0- 3	5w	55	2.00	80	S	5,924	1.1

map sym	soil name	slope	land Cap.	Lnd Cap. Index	Prod. Equivalent	prd index	if	# acres	% acres
ClA	collinston loamy fine sand	0- 3	3e	94	1.50	60	S	468	0.1
CmC	collinston loam	1- 6	3e	94	1.50	60	S	813	0.2
CmD	collinston loam	6-10	4e	75	1.50	60	L	854	0.2
CmE2	collinston loam	10-30	6e	30	1.00	40	0	1,304	0.2
CoA	crookston loam	0- 3	3c	100	2.40	96	P	3,245	0.6
CoB	crookston loam	3- 6	3e	100	2.00	80	P	401	0.1
CoC	crookston loam	6-10	3e	94	1.80	72	S	295	0.1
CrB	crowshaw gravelly loam	3- 6	3e	100	2.00	80	P	316	0.1
CrC	crowshaw gravelly loam	6-10	3e	94	2.00	80	S	1,048	0.2
CrD	crowshaw gravelly loam	10-20	4e	75	2.00	80	L	673	0.1
CSE	curtis creek-goring associati	6-30	7s	26	0.70	28	0	2,386	0.5
CSG	curtis creek-goring associati	30-60	7s	26	0.70	28	0	1,687	0.3
DaC	dagor silt loam	4- 8	3e	94	2.00	80	S	275	0.1
DaD	dagor silt loam	10-20	4e	75	1.50	60	L	433	0.1
DEG	dateman extremely rocky silt	40-80	7e	23	0	0	0	7,950	1.5
DHG	dateman-bradshaw association	30-70	7e	23	0	0	0	3,258	0.6
DLG	datwyler cobbly silty clay lo	30-60	7e	23	0.90	36	0	670	0.1
DNG	datwyler-elzinga-maughan asso	30-60	7e	23	0.90	36	0	6,366	1.2
DPG	despain-bickmore association	30-70	7e	23	1.30	52	0	1,772	0.3
DSG	despain-lucky star associatio	30-70	7e	23	1.30	52	0	814	0.2
EDG	elwood silt loam	30-60	7e	23	0	0	0	688	0.1
EGE	elwood-agassiz association	6-30	6e	30	0	0	0	999	0.2
EME	elwood-mult association	6-30	6e	30	0	0	0	1,182	0.2
EMG	elwood-mult association	30-60	7e	23	0	0	0	4,558	0.9
FGD	fitzgerald stony loam	10-20	7s	26	0	0	0	2,730	0.5
FLD	flygare silt loam	3-20	6e	30	1.90	76	0	1,597	0.3
FOG	foxol rocky loam	30-60	7s	26	0.70	28	0	4,907	0.9
GGE	goring silt loam	6-30	6e	30	1.30	52	0	5,979	1.1
GOE2	goring-obray association	3-30	6e	30	1.60	64	0	8,438	1.6
Gp	gravel pit	0- 0	8s	0		0	0	356	0.1
GrA	green canyon gravelly loam	0- 3	6s	50	1.60	64	S	1,641	0.3
GrB	green canyon gravelly loam	3- 7	6s	50	1.40	56	S	423	0.1
GsA	greenson loam	0- 3	4w	88	2.00	80	P	12,473	2.4
GsB	greenson loam	3- 6	4w	88	2.00	80	P	699	0.1
GsC	greenson loam	6-10	4w	77	2.00	80	S	251	0.0
GuA	greenson loam	0- 1	3w	90	2.00	80	S	626	0.1
GvA	greenson loam	0- 1	4w	88	1.80	72	P	238	0.0
HdA	hendricks silt loam	1- 3	2c	100	2.00	80	P	507	0.1
HdB	hendricks silt loam	3- 6	2e	100	2.00	80	P	660	0.1

map sym	soil name	slope	land Cap.	Lnd Cap. Index	Prod. Equivalent	prd index	if	# acres	% acres
HdC	hendricks silt loam	6-10	3e	94	2.00	80	S	1,542	0.3
HdD	hendricks silt loam	10-20	4e	75	1.70	68	L	2,438	0.5
HeC	hiibner gravelly clay loam	3-10	3e	94	1.50	60	S	228	0.0
HeD	hiibner gravelly clay loam	10-30	4e	56	1.60	64	0	264	0.1
HeE	hiibner gravelly clay loam	20-30	6e	30	1.60	64	0	201	0.0
HfE	hiibner extremely stony clay	1-30	4e	56	1.60	64	0	1,902	0.4
HgE2	hillfield silt loam	20-30	6e	30	1.00	40	0	301	0.1
HhE2	hillfield-timpanogos silt loa	10-30	4e	56	1.21	48	0	1,250	0.2
HIB	hoskin gravelly loam	1- 6	6e	30	1.30	52	0	755	0.1
HKG2	hoskin cobbly loam	30-70	7e	23	0.90	36	0	1,717	0.3
HLG2	hoskin-datwyler association	30-70	7e	23	0.90	36	0	600	0.1
HMG2	hoskin-elzinga association	30-70	7e	23	0.90	36	0	1,510	0.3
HNG	hoskin-scave association	6-70	7e	23	0.90	36	0	3,140	0.6
HOG2	hoskin-scout association	30-70	7e	23	0.90	36	0	4,662	0.9
HSG2	hoskin-smarts association	0-70	7e	23	0.90	36	0	930	0.2
HuC	hyrum gravelly loam	4- 8	3e	94	2.00	80	S	562	0.1
HuE	hyrum gravelly loam	10-25	4e	75	1.50	60	L	668	0.1
HyC	hyrum cobbly loam	4- 8	3e	85	2.00	80	L	428	0.1
Jo	jordan silty clay loam	0- 1	7w	19	1.10	44	0	995	0.2
Jr	jordan-lasil silty clay loams	0- 3	7w	19	1.10	44	0	1,247	0.2
KdA	kidman fine sandy loam	0- 2	4c	100	2.40	96	P	2,858	0.5
KdD	kidman fine sandy loam	8-15	6e	40	2.00	80	L	143	0.0
KfA	kidman fine sandy loam	0- 2	4c	100	2.40	96	P	7,937	1.5
KfB	kidman fine sandy loam	2- 4	4e	94	2.20	88	P	362	0.1
KfC	kidman fine sandy loam	4- 8	4e	83	2.00	80	S	581	0.1
Ks	kirkham-shay complex	0- 1	4w	88	1.80	72	P	1,189	0.2
Kt	kirkham-shay complex	0- 1	4w	53	0.85	34	0	688	0.1
La	lakewin gravelly coarse sandy	0- 2	6s	45	1.00	40	0	423	0.1
LCG	laplatta silty clay loam	30-50	7e	23	1.30	52	0	258	0.0
LGE	laplatta-obray association	6-30	6e	30	1.30	52	0	5,100	1.0
Lh	layton loamy fine sand	0- 1	4s	98	2.20	88	P	1,970	0.4
LMG2	leatham-barfuss association	30-50	7e	23	1.10	44	0	1,997	0.4
Ln	lewiston fine sandy loam	0- 3	4w	88	2.00	80	P	9,069	1.7
Lo	lewiston fine sandy loam	0- 3	4w	70	1.60	64	L	498	0.1
Lr	logan silty clay loam	0- 3	5w	77	1.60	64	S	2,587	0.5
LSE	lucky star silt loam	6-30	6e	30	1.90	76	0	5,534	1.1
LTG	lucky star gravelly silt loam	30-60	7e	23	1.90	76	0	14,553	2.8
LUE	lucky star-goring association	6-30	6e	30	1.90	76	0	4,739	0.9
LVE	lucky star-hoskin association	6-30	6e	30	1.90	76	0	2,251	0.4
LWE	lucky star-red spur complex	6-30	6e	30	1.90	76	0	1,123	0.2

map sym	soil name	slope	land Cap.	Lnd Cap. Index	Prod. Equivalent	prd index	if	# acres	% acres
LXE	lucky star-scout association	6-40	6e	30	1.90	76	0	2,468	0.5
M-W	miscellaneous water	0- 0	0	0	0	0	0	495	0.1
MAG	maughan-datwyler association	30-60	7e	23	1.30	52	0	758	0.1
McA	mcmurdie silt loam	0- 3	2e	100	2.00	80	P	793	0.2
McB	mcmurdie silt loam	3- 6	2e	100	2.00	80	P	1,654	0.3
McC	mcmurdie silt loam	6-10	3e	94	2.00	80	S	1,006	0.2
MdE2	mcmurdie-hillfield silt loams	10-30	4e	56	1.30	52	0	639	0.1
MeA	mendon silt loam	0- 3	2c	100	2.50	100	P	9,629	1.8
MeB	mendon silt loam	3- 6	2e	100	2.50	100	P	5,259	1.0
MeC	mendon silt loam	6-10	3e	94	2.00	80	S	2,091	0.4
MfB	mendon-collinston complex	1- 6	2e	100	2.00	80	S	1,401	0.3
MfE2	mendon-collinston complex	6-30	3e	64	1.30	52	0	4,853	0.9
MlA	millville silt loam	0- 2	3w	100	2.00	80	P	1,663	0.3
MlB	millville silt loam	2- 4	3e	100	2.40	96	P	788	0.2
Mm	mixed alluvial land	0- 0	8w	0	0	0	L	5,329	1.0
MNE	mult-agassiz association	6-30	6e	30	1.30	52	0	3,717	0.7
MNG2	mult-agassiz association	30-70	7e	23	1.30	52	0	1,081	0.2
MoG2	munk-blackrock gravelly loams	30-70	7s	26	1.00	40	0	2,648	0.5
MSE	mult-lucky star association	6-30	6e	30	1.90	76	0	668	0.1
NbB	nebeker silt loam	3- 6	2e	100	2.00	80	P	388	0.1
NbC	nebeker silt loam	6-10	3e	94	2.00	80	S	1,508	0.3
NbE	nebeker silt loam	10-25	4e	75	1.80	72	L	5,254	1.0
NcA	nibley silty clay loam	0- 3	3w	90	2.00	80	S	7,475	1.4
NcB	nibley silty clay loam	3- 6	3w	90	1.80	72	S	992	0.2
ObB	obray silty clay	1- 6	6e	30	1.60	64	0	199	0.0
PaA	parleys silt loam	0- 3	3e	100	2.00	80	P	1,423	0.3
PaB	parleys silt loam	3- 6	3e	100	2.00	80	P	951	0.2
PaC	parleys silt loam	6-10	3e	100	1.80	72	P	469	0.1
PlA	parlo silt loam	0- 3	3s	100	1.50	60	P	2,463	0.5
PlB	parlo silt loam	3- 6	3s	100	1.50	60	P	472	0.1
PlC	parlo silt loam	6-10	3e	94	1.50	60	S	173	0.0
Pn	payson silt loam	0- 1	7w	19	1.10	44	0	1,301	0.2
POG2	picayune-agassiz association	30-80	7e	23	1.30	52	0	2,554	0.5
PRG	picayune-smarts association	30-80	7e	23	1.30	52	0	877	0.2
PSG2	poleline-agassiz association	30-70	7s	26	0.90	36	0	1,671	0.3
PtC	preston fine sand	0-10	6s	50	1.20	48	S	311	0.1
Pu	provo loam	0- 1	5w	50	1.60	64	L	1,396	0.3
Pv	provo gravelly loam	0- 3	5w	50	1.60	64	L	712	0.1
Qu	quinney silt loam	0- 1	3w	90	1.80	72	S	2,668	0.5
RCG2	richmond very stony loam	30-70	7s	26	0.90	36	0	2,654	0.5

map sym	soil name	slope	land Cap.	Lnd Cap. Index	Prod. Equivalent	prd index	if	# acres	% acres
RDG2	richmond-middle association	0-70	7s	26	0.90	36	0	5,709	1.1
REG2	richmond-munk association	30-70	7s	26	0.90	36	0	962	0.2
RFG2	richmond-nebeker association	30-70	7s	26	0.90	36	0	4,085	0.8
RGG2	richmond-sterling association	30-70	7s	26	0.90	36	0	2,157	0.4
RhA	ricks gravelly loam	0- 3	6s	50	1.60	64	S	4,979	0.9
RhB	ricks gravelly loam	3- 6	6s	50	1.60	64	S	1,493	0.3
RhC	ricks gravelly loam	6-10	6s	50	1.60	64	S	965	0.2
Rk	riverwash	0- 0	8w	0	0	0	0	226	0.0
RO	rock land	0- 0	8s	0	0	0	0	14,875	2.8
Rs	roshe springs silt loam	0- 3	5w	55	2.00	80	S	2,754	0.5
Rt	rough broken land	0- 0	8s	0	0	0	0	3,184	0.6
SAG	st. marys gravelly very fine	30-60	7e	23	0.90	36	0	631	0.1
SCG	st. marys-curtis creek associ	30-60	7e	23	0.90	36	0	2,050	0.4
Sd	salt lake silty clay loam	0- 1	5w	50	1.80	72	L	734	0.1
Se	salt lake silty clay	0- 1	5w	50	1.67	67	L	2,161	0.4
Sf	salt lake-logan complex	0- 1	5w	50	1.70	68	L	300	0.1
Sg	salt lake-roshe springs compl	0- 3	3w	82	0.84	34	L	2,954	0.6
Sh	salt lake-trenton complex	0- 2	5w	50	0.57	23	L	408	0.1
SIE	scave silt loam	10-30	6e	30	1.90	76	0	2,020	0.4
SKE	scave cobbly silt loam	10-30	6e	30	1.90	32	0	866	0.2
SLG	scout gravelly loam	40-70	7e	23		0	0	1,051	0.2
Sm	shay silty clay loam	0- 1	4w	77	1.80	72	S	382	0.1
SNG2	sheep creek cobbly loam	30-70	7e	23	0.90	36	0	4,320	0.8
SOG2	sheep creek-agassiz associati	30-70	7e	23	0.90	36	0	6,259	1.2
SPG2	sheep creek-despain associati	30-70	7e	23	0.90	36	0	2,015	0.4
SRG2	sheep creek-maughan associati	30-70	7e	23	0.90	36	0	2,853	0.5
SSE	smarts silt loam	10-30	6e	30	1.30	52	0	1,152	0.2
STG2	smarts-hoskin association	30-70	7e	23	1.30	52	0	4,158	0.8
SUG	smarts-lucky star-poleline as	30-70	7e	23	1.30	52	0	6,040	1.2
SvA	steed gravelly loam	0- 3	6s	50	1.40	56	S	2,636	0.5
SvB	steed gravelly loam	3- 6	6s	50	1.20	48	S	733	0.1
SvC	steed gravelly loam	6-10	6s	50	1.50	60	S	1,061	0.2
SwC	sterling gravelly loam		6s	50	1.20	48	S	545	0.1
SwD	sterling gravelly loam	10-20	6s	45	1.20	48	L	2,867	0.5
SwF2	sterling gravelly loam	20-50	7s	26	1.00	40	0	4,391	0.8
Sy	stony alluvial land	0- 0	8w	0	0	0	0	1,060	0.2
TmA	timpanogos silt loam	0- 3	3e	100	2.00	80	P	1,928	0.4
TmB	timpanogos silt loam	3- 6	3e	100	2.00	80	P	1,033	0.2
TmC	timpanogos silt loam	6-10	3e	94	1.50	60	S	814	0.2

map sym	soil name	slope	land Cap.	Lnd Cap. Index	Prod. Equivalent	prd index	if	# acres	% acres
TmD2	timpanogos silt loam	10-20	4e	75	1.50	60	L	328	0.1
TnA	timpanogos silt loam	0- 3	5w	63	2.00	80	P	1,850	0.4
TrA	trenton silty clay loam	0- 2	3s	88	1.00	40	L	13,269	2.5
TrB	trenton silty clay loam	2- 4	3s	88	1.00	40	L	324	0.1
TrC	trenton silty clay loam	4- 8	4w	70	1.00	40	L	528	0.1
TrD2	trenton silty clay loam	8-20	4e	40	0.80	32	L	706	0.1
TtA	trenton silty clay loam	0- 2	4w	53	1.40	56	0	3,672	0.7
W	water	0- 0	0	0	0	0	0	7,406	1.4
WhE	wheelon silt loam	10-30	6e	30	0.50	20	0	1,415	0.3
WhF2	wheelon silt loam	30-50	7e	23	0.90	36	0	3,490	0.7
WlE2	wheelon-collinston complex	10-30	6e	30	0.71	28	0	9,001	1.7
Wn	winn silt loam	0- 3	3w	90	1.60	64	S	2,172	0.4
Wp	winn-provo complex	0- 3	3w	90	1.60	64	S	1,003	0.2
Wr	woods cross silty clay loam	0- 3	7w	28	1.60	64	S	226	0.0
YHE	yeates hollow cobbly silt loa	6-30	7s	26	0.90	36	0	5,428	1.0
YHG	yeates hollow cobbly silt loa	30-70	7s	26	0.90	36	0	4,372	0.8
YLE2	yeates hollow cobbly silty cl	3-30	7s	26	1.60	64	0	8,092	1.5